FIFTH NATIONAL PRE-CONVENTION NUMBER

Vol. III February, 1940 No. 1

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The Journal of the International College of Surgeons

(Founded in Geneva, 1935)

PUBLISHED BIMONTHLY UNDER THE AUSPICES OF THE UNITED STATES CHAPTER

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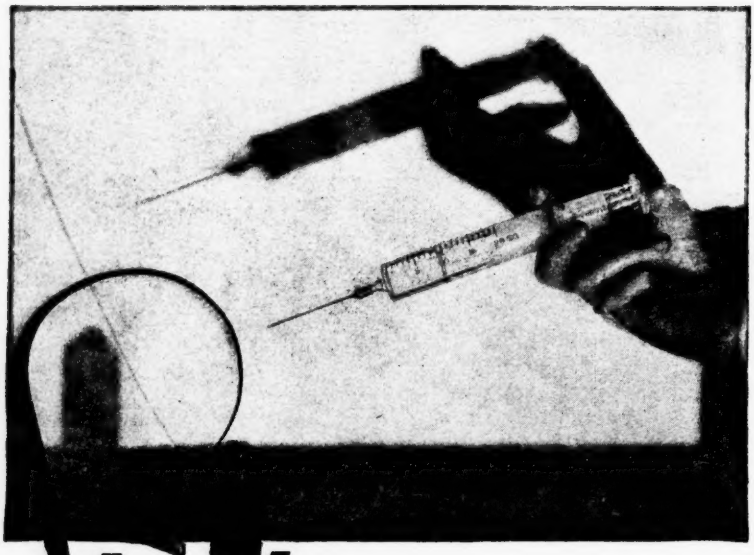

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Medical

Editorials

IS THE LINE OF DEMARCATION BETWEEN MEDICINE AND SURGERY BECOMING EFFACED?

SINCE the beginning of documented medicine there has been a line of demarcation between the functions of the physician and the surgeon. The division was both logical and satisfactory and was well adapted to early conditions. Because of its practical basis, it has persisted nearly to our time. It seems reasonable to suppose that this imaginary line was there from the beginning and that medical men merely widened it. Indeed, they widened it to a zone behind which both sides became quite firmly entrenched.

The reason why this line was so easy to trace in the beginning was that certain physical ailments quite obviously needed different management. Wounds received in battle and in encountering savage beasts, and the accidental injuries of daily life demanded immediate urgent attention to stem the flow of blood, to replace as well as possible the original position of broken or dislocated bones or to close an open body cavity. Effective treatment depended upon quick, positive action, and the surgeon adapted himself to this end. After he became more learned, more skilful and more bold, he extended his field to include the treatment of other affections, such as the opening of abscesses and the removal of tumors, and with the onward march of time he extended his field to the limits reached by the modern surgeon. In doing this he unconsciously, perhaps, widened the zone which separated him from the physician; yet this zone, wide as it became, was not surrounded on either side by impenetrable ideas so that now it has become in places very narrow indeed.

The surgeon in times past was not always as learned as the physician, but he was perhaps more resourceful because he was obliged to cope with many emergency conditions, often using the simplest of tools. He usually looked with disdain upon the great array of drugs of the physician and resorted to the use of but a chosen few whose actions seemed both certain and beneficial.

The modern surgeon has enlarged his domain to a great extent by using his methods in fields previously assumed to belong to the physician. In the field of nervous disease he has opened the cranial cavity to work with painstaking care on the brain, in pulmonary tuberculosis he has performed phrenectomies, thoracotomies and lobectomies, while in valvular heart disease he has dared to work upon the valves of the heart themselves. Such a list could be made tediously long.

The extension of the surgical field necessitated the development of many surgical specialists so that the classification of general surgeon is fast disappearing. The neophyte in surgery wishes to develop quickly a subdivision in which he is interested in order that, by narrowing his field of study and practice, he may master it more thoroughly.

Besides the tendency for the surgeon to treat diseases formerly considered medical, a great change has taken place

in the modern surgeon in his use of many nonsurgical measures. This he has done eargerly and with a keen sense of appreciation. Probably the first of these measures was the roentgen ray and then radium, to be followed by protective and curative sera and more recently by glandular extracts and vitamines. The adoption of such curative means, if of proven value, denotes an alert and appreciative mind. Some of these measures he now frequently substitutes for the scalpel in conditions previously considered purely surgical, such as roentgen ray therapy for malignant neoplasms and estrogenic substance for benign tumors of the breast.

Whether a surgeon is justified in appropriating nonsurgical measures, which by right of custom ought to belong to the physician, might be debatable. Nevertheless, as long as a surgeon remains within the field of his specialty, it would seem that he is justified in using whatever approved means are at hand to serve his purpose of rendering benefit to his patient. Furthermore, as Nicholas Senn once stated, "In order to be a good surgeon, one must first of all be a good physician."

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GRANULOMATOUS INFLAMMATION PRODUCED BY FOREIGN BODY IRRITANTS*

THOMAS L. RAMSEY, M.D. and FRED M. DOUGLASS, M.D., F.A.C.S., F.I.C.S.

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REACTIONS to foreign body substances in the tissues have been observed and studied for some time. Early papers to this effect were published by Lambert[1] in 1912, and summaries of papers by Harrison, Lambert, Hanes, Burroughs and others[2] were published in 1913.

Lambert's work was concerned mostly with the production of giant cells in lymphocytic cultures in vitro by using lycopodium spores as foreign body elements. The giant cells were formed by fusion of several cells about the foreign body.

The subject we wish to present concerns principally the granulomatous reactions that are caused by the use of lycopodium powder and powdered talc.

DEFINITION AND COMPOSITION

Lycopodium powder consists merely of the spores of a species of club-moss known as Lycopodium Clavatum which belongs to the fern family. This plant is also known as wolf's-foot, wolf's-claw and witch meal. The powder produced from the spores is listed as lycopodium powder in the U.S. Pharmacopia. It is a fine, light yellowish substance, used as a desiccant and absorbent on moist and excoriated surfaces. It has also been used as an inert powder for embedding pills and in covering suppositories to prevent adhesion of the surfaces. The spores are irregular, trianguloid or spherical bodies with edges showing short spinous processes between which is a dimpled surface. They measure about 30 microns in diameter. On cross section they appear as a ring with serrated margins and contain a coarsely granular substance.

Chemical analysis of the spores shows about 48 per cent neutral nondrying oils, lycopodic, oleic and stearic acids and minute amounts of cholestrin and glycerin. The spores are acid-fast and stain readily with aniline dyes.

Talcum or talc, U.S.P., is a native hydrous magnesium silicate. It is a white, greasy powder and is used as a dusting powder and lubricant. In some instances a combination of lycopodium and talc, which makes an excellent, easily sterilized powder, has been used on the hands and gloves during operative procedures.

LESIONS PRODUCED

These foreign body substances, when introduced into the tissues by the hands, gloves or suppositories, or by absorption following their use as a dusting powder cause a reaction due to irritation and produce inflammation of a granulomatous type. The granulomas vary somewhat in appearance, according to the location. They are generally somewhat nodular and show lymphocytic infiltration, fibroblasts and giant cells of the foreign body type. In some cases they closely resemble tubercles even to central caseation and necrosis. The lycopodium spores or the talc crystals are usually found within the large multinuclear giant cells. The lesions are

*Presented at the Academy of Medicine, Lucas County, Toledo, Ohio, October 13, 1939.

not of importance of themselves, unless they involve areas where important tissues are destroyed or where lesions are formed causing adhesions or contraction due to scar tissue formation. It is also important to remember that when the spores or crystals are found embedded in the lesions or in the giant cells, they can be considered as etiologic factors producing the inflammation.

The use of lycopodium as a dusting powder has been largely discontinued, but its use on suppositories and for embedding freshly prepared pills still constitutes a certain menace. The extensive use of magnesium silicate or talc justifies this additional report.

LITERATURE

The literature on the subject is rather meager. Antopole[3] reported six cases of lycopodium granuloma in 1933. His cases involved tissues of the neck, breast, epididymis, sinus tract leading to the kidney, bladder neck and peritoneum of the intestine.

Often a sinus tract leading to the involved area is present. Previous operative procedures had been performed in every case and the lesions followed the introduction of the spores into the tissues at the time of operation.

Antopole also called attention to the possibility of granulomatous lesions following the use of magnesium silicate. He was able to produce granulomatous inflammation by animal experimentation, using lycopodium spores, in from two to six weeks. He called attention to the similarity of the inflammatory process in the lmpyh nodes to tuberculosis.

Erb[4] reported six cases of lycopodium granuloma in 1935. He holds to the opinion that spores not only act as foreign body irritants, but have a chemical influence on the tissues as well. He mentions the brief literature dealing with its pathologic effects and discusses differential diagnosis. The tissues involved in Erb's cases were the maxillary sinus following a radical antrum operation; the surface of the liver following an exploratory operation, during which the liver was palpated; the intestinal peritoneum two and one-half years after appendectomy; a sinus tract to the spine following lamenectomy; and the brain following drainage of an abscess of the frontal lobe. Autopsy after two months showed granulomatous inflammation in an area where a rubber drainage tube had been inserted. All these cases following operative procedure indicated that lycopodium spores had been introduced into the tissues. The spores were found in the granulomatous inflammatory areas.

Grieco[5] in 1936 reported the results of his experiments with the use of lycopodium and powdered talc. Rabbits were subjected to surgical procedures, the operator using sterile rubber gloves abundantly powdered with these substances. The operative procedure was that of laparotomy and involved handling of the intestines and various tissues. The wounds were closed and the animals were kept for varying periods of time after which they were killed and postmortem examination was made.

As a result of his experiments, he was definitely convinced that powdered lycopodium and talc were both actively instrumental in the formation of granulomatous lesions in the injured tissues and that definite intraabdominal adhesions occurred between loops of the intestines and also between the intestines and the under surface of the laparotomy wounds. He also found granulomatous inflammation in the wounds. The granulomas showed the typical giant cell reaction with an attempt on the part of these cells to destroy the foreign substances.

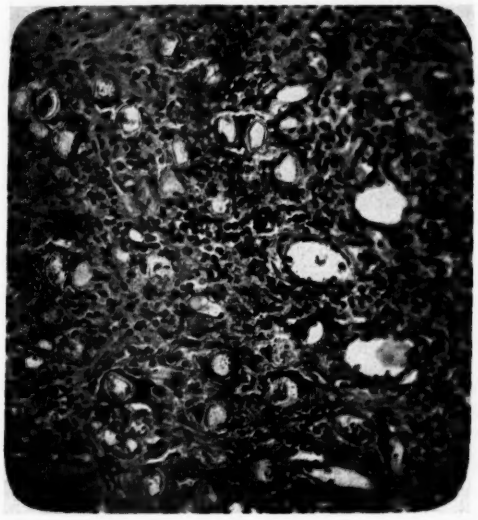
Fienberg[6] reported two cases of granuloma caused by crystals of talc. He also reported lesions produced in mice by instillation of talc crystals into the tissues. He advised against the indis-

criminate use of talcum powder in the operating room because of the possibility of granulomatous lesions.

Antopole and Robbins[7] in 1937 again discussed lycopodium granuloma, reporting another instance of this condition following the use of rectal suppositories which had been covered with lycopodium powder. These suppositories had been introduced into the rectum following operation for hemorrhoidectomy.

AUTHOR'S CASES

We wish to report two cases of granulomatous inflammation caused by the introduction of lycopodium spores into the tissues and three cases of granulomatous lesions in which crystals of magnesium silicate or talc were found.



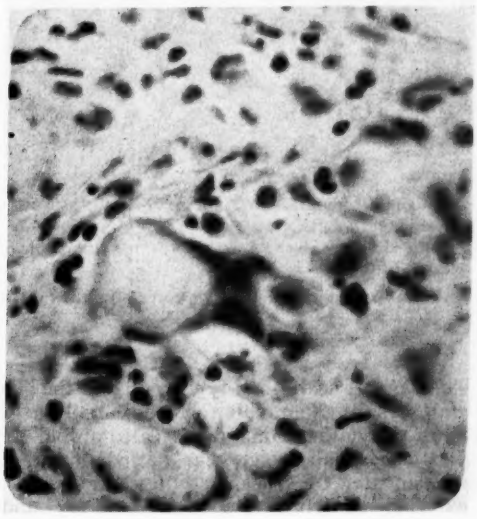


Fig. 1. Left, lycopodium spores in granulation tissue from Case 1, with ulceration in vaginal vault. Low power magnification.

Fig. 2. Right, lycopodium spore in foreign body giant cell from Case 1. High power magnification.

CASE NO. 1. The patient was an adult female, aged 53 years, with ulceration in the vaginal vault. Carcinoma was suspected and radium was introduced in May, 1933. In July, 1933 hysterectomy was performed. The examination of the tissue at that time was reported as not malignant.

Leading up to the period when the ulceration was found, the patient had suffered from a foul smelling discharge. Following the hysterectomy, some bleeding continued sporadically, but in small amounts. There was no weight loss and the patient did not complain of feeling ill. The general physical examination was practically negative. On account of the bleeding the patient entered the hospital for a biopsy, which was taken from the persistent lesion in the vaginal vault.

Sections made from the tissue removed showed a chronic granulomatous inflammation. The surface stratified epithelium was destroyed. There was some attempt toward healing and scar tissue formation and diffuse inflammatory cell infiltration was present, consisting mostly of leucocytes, monocytes and plasma cells; many giant cells were seen, some of which contained partially disintegrated lycopodium spores. Fibroblastic proliferation was diffusely present.

A diagnosis was made of chronic granulomatous inflammation resulting from irritation caused by lycopodium spores. These spores were probably introduced into the tissues during the vaginal hysterectomy or possibly following postoperative treatment. There was no malignancy.

The area was excised. The patient made an uneventful recovery and has had no recurrence of the condition.

CASE NO. 2. The patient, an adult female, aged 33 years, had had some bleeding for a period of about one year and a half. This bleeding occurred mostly before and following the menstrual period and lasted about ten days in all. There had been no pain or distress. ing the history, there was no knowledge of the use of vaginal suppositories. The probable introduction of the spores was from lycopodium powder used upon rubber gloves during vaginal examination and repair of a cervical laceration following a delivery. After excision of the

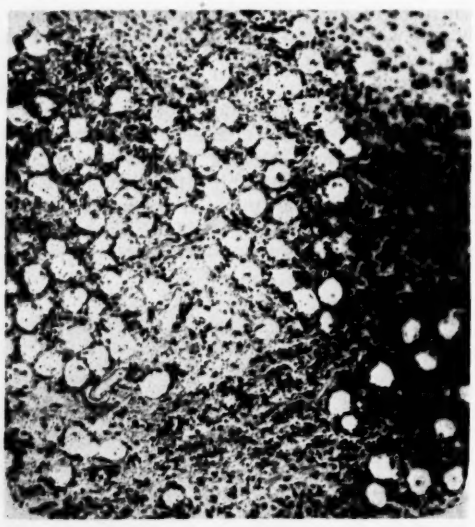


Fig. 3. Left, lycopodium spores in granulation tissue from Case 2, with ulceration of the cervix. Low power magnification.

Fig. 4. Right, lycopodium spores and one crystal of magnesium silicate from Case 2. High power magnification.

The general health had been good and the general physical examination was essentially negative. Vaginal examination revealed an old cervical laceration which was healed, but there was an area of erosion at the margin of the external os which bled rather freely upon manipulation.

Curettage was performed and a portion of the involved cervix was removed for microscopic examination.

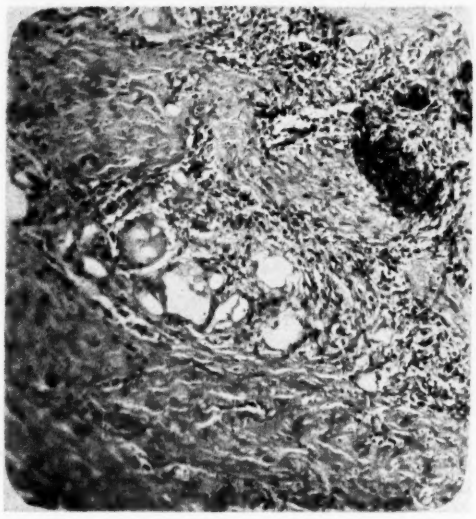
The sections from the cervix showed chronic cystic endocervicitis. There was a moderate degree of polypoid hyperplasia of the mucosa. The surface stratified epithelium showed erosion, and in the underlying tissues considerable inflammatory infiltrate was present, consisting mostly of small round cells, large mononuclears, plasma cells and giant cells. Lycopodium spores were found loose in the tissue, also within the giant cells. Fibroblastic proliferation was present throughout the stroma. The uterine scrapings showed beginning premenstrual glandular hyperplasia. There was no evidence of any malignancy. In review- area there has been no further evidence of bleeding.

CASE NO. 3. The patient, an adult female, aged 50 years, complained of pain in the back and lower abdomen. She had had two abdominal operations, one 17 years prior to the date of the present trouble, at which time the right tube and ovary had been removed; about a year later a second operation was performed for the relief of pain in the lower abdomen and adhesions. Following the second operation the patient was fairly well with the exception of periodic attacks of pain at the time of the menstrual periods. During the last month the pains were more severe and the patient developed symptoms of intestinal obstruction.

At operation many adhesions were found between the loops of the intestines and between the visceral and the parietal peritoneum; constricting bands were present, causing partial obstruction; one loop of the ileum was adherent to the stump of the left ovary which had been previously removed.

The adhesions were freed, the rough surfaces were covered by turning in the raw areas and several small portions of inflammatory tissue were removed for microscopic examination.

The sections from these tissues showed a chronic productive and granulomatous inflammation with round cell infiltration, mononuclears and plasma cells; many giant cells were present around crystals of magnesium silicate. The crystals were also scattered diffusely throughout the tissues.



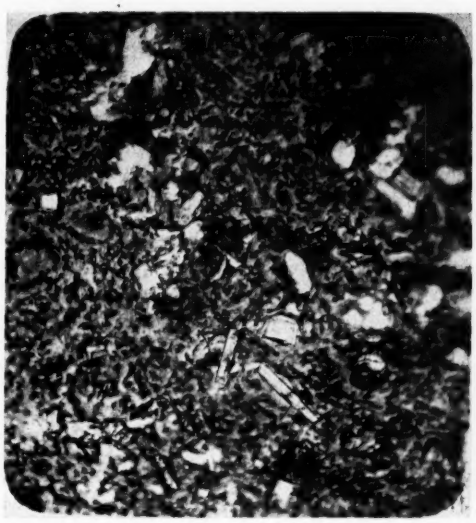


Fig. 5. Left, characteristic granulomatous inflammatory reaction with giant cells around crystals of magnesium silicate from Case 3. Numerous adhesions between the serosal surfaces of the intestines and partial intestinal obstruction were present. Low power magnification.

Fig. 6. Right, numerous magnesium silicate crystals in granulomatous tissue from nodules present on loops of the ileum from Case 4. Low power magnification.

These findings indicate that the introduction of this powder during one of the previous operations had produced the granulomatous inflammation and resulting scar tissue formation, which appeared to be a causative factor in the production of the adhesions and partial intestinal obstruction.

Following this operation, the patient has so far suffered no further return of the symptoms.

CASE No. 4. The patient was an adult, white female, aged 32 years. She was first seen in November, 1936, when she entered the hospital complaining of pains in the gall bladder region and also in some of the joints and muscles. She had had some backache with nausea and vomiting.

The patient had been operated on 10 years previously, at which time some pelvic surgery was performed, probably shortening of the ligaments and appendectomy.

During the examination in the hospital, a gastrointestinal examination was performed and the impression was that the patient was suffering from partial obstruction of the bowel in the region of the sigmoid colon and terminal ileum. A diagnosis was also made of chronic cholecystitis.

The patient was operated upon, a right upper rectus incision being made, and the gall bladder was removed. Exploration of the lower abdomen disclosed many adhesions in the region of the terminal ileum. The omentum was found adherent to the under surface of the old lower abdominal incision. These adhesions were freed as much as possible, the raw surfaces were peritonealized and the abdominal wound was closed. The patient made an uneventful recovery and was discharged improved.

Six months later this patient again entered the hospital, complaining of severe dysmenorrhea which had become progressively worse

since the last operation. Her periods were irregular and there was sometimes a dark chocolate colored discharge.

The general physical examination showed nothing of importance except that the patient appeared poorly nourished. The vaginal examination revealed a cervical erosion and scarring, the uterus was small but freely movable and rectocele and cystocele were present in moderate degree.

An operation was again necessary. Perineorrhaphy, complete hysterectomy and right salpingo-oophorectomy were performed. The right ovary was found to be cystic and there were adhesions between the omentum and the old incision and the pelvic viscera. These adhesions were freed, the raw surfaces peritonealized and the abdominal wound closed.

Examination of the tissues removed showed cystic endocervicitis, atrophic sclerosis of the uterus, atrophic endometritis, fibrosclerosis and cystic degeneration of the ovary.

This patient again entered the hospital on October 2, 1938, which was about 13 months after her last pelvic operation. At this time she was again suffering from definite symptoms of partial intestinal obstruction.

She was again operated upon. The transverse colon was freed from the lower angle of the gall bladder incision and the pylorus was freed from its attachment to the under surface of the liver. There were adhesions in the pelvis in the region of the ligaments and the vaginal stump. The left tube and ovary were removed at this time. A loop of the ileum was freed from the transverse colon with great difficulty. Sections from the tube and ovary were made. Microscopic examination of the ovary showed cortical sclerosis. The serosal surface was covered with multiple granulomas in which were found many foreign body type giant cells forming around numerous crystals that were identified as magnesium silicate. The tube showed chronic congestion and edema.

This patient made an uneventful recovery and was discharged in about two weeks.

The finding of granulomatous inflammation in the tissues removed and of the large numbers of crystals of silicate indicates that this pathology was an important factor in the long postoperative history in this case. It does not, of course, seem to have any connection with the gall bladder disease or with the chronic pathological process present in the pelvic viscera, with the exception of the numerous adhesions that were present.

CASE No. 5. Miss M. R., an adult female, aged 43 years, was first admitted to the hospital four years ago for correction of retroversion and for removal of a chronic infected appendix. At this time a Gillian-Barrett round ligament operation was performed and the appendix was removed. The tubes and ovaries and gall bladder region were explored and were negative.

The examination of the appendix showed chronic inflammation with areas of scar tissue indicating previous inflammation; the mucosa showed erosion with undermining infection. The patient left the hospital after 10 days in good condition.

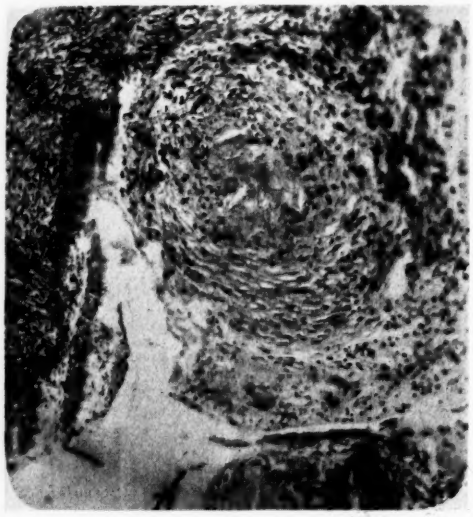


Fig. 7. Showing typical granulomatous nodule with giant cell and magnesium silicate crystals from Case 5. Chronic adhesions were present along terminal ileum, sigmoid and over the surfaces of ovaries and tubes. Low power magnification.

About 16 months later this patient reentered the hospital, complaining of loss of weight, fatigue, and pain in the lower abdominal region and in the region of the gall bladder. A diagnosis of cholecystitis was made at this time and cholecystectomy was performed. Examination of the gall bladder showed some edema, scattered areas of round cell infiltration and chronic catarrhal changes in the mucosa. The patient left the hospital two weeks later with some improvement in her general condition.

One year later this patient was again admitted to the hospital with vague complaints of pain in the lower abdomen, discomfort and considerable nervousness. The general physical examination was practically negative. Her blood pressure was 146/80. She had always had a tendency towards hyperthyroidism. It

was thought that the symptoms were probably due to adhesions formed following the previous operations.

An exploratory incision was made and numerous small nodular areas were seen along the terminal ileum and in the region of the sigmoid. The left ovary was cystic and about the size of an orange. Both tubes and both ovaries and several of the nodular growths from the serosal surface of the ileum and sigmoid were removed.

Sections from these nodules showed chronic granulomatous inflammation with numerous giant cells present. Most of these were seen developing around and near crystals of a foreign substance. The crystals were irregular in shape, somewhat elongated, flattened and with sharp and irregular borders; some were adherent in groups. The surrounding stroma was fibroblastic with round cell infiltration.

Sections from the ovaries showed areas of granulomatous inflammation on the serosal surfaces. Both tubes showed chronic inflammation with congestion of vessels and edema.

The pathologic diagnosis was multiple small nodular granulomas from the serosal surfaces of the ileum, sigmoid and both ovaries, foreign body reactions around crystals of magnesium silicate, cystic degeneration of the ovaries, and chronic congestion and edema of the tubes. The adhesions were freed and the abdominal wound closed. The patient was discharged from the hospital after three weeks.

The patient was never fully relieved from symptoms following the last operation. She had continued abdominal distress and constipation, but pain was not a prominent symptom. The general physical examination in general was negative. The blood pressure at this time was 170/86.

Examination of the abdomen showed no tenderness, no masses, no rigidity. The symptoms were again thought to be due to lower abdominal adhesions.

The patient was again operated upon; the sigmoid showed chronic inflammatory induration, but very few adhesions were present. The findings suggested diverticulitis, and on account of the extensive involvement a resection of the sigmoid was performed and a cecostomy made. The cecostomy opening was closed after about three weeks.

The examination of the sigmoid showed rather extensive involvement of the wall by granulomatous inflammation in which crystals of magnesium silicate were present. Diverticulitis of the sigmoid was a complicating factor which probably added to the symptoms and necessitated removal of this portion of the bowel. The patient was in the hospital this time five weeks, being discharged August 20, 1939. The cecostomy was closed eight days prior to discharge.

COMMENT

In view of the fact that many cases of granulomatous inflammation have been caused by contamination of tissues by spores of lycopodium powder and crystals of magnesium silicate or talc, it seems that more attention should be paid to the use of these substances in the practice of medicine and surgery. It has been surprising in discussing this subject with many physicians that they did not seem to be aware of any danger following their usage.

The rather extensive use of talcum powder on rubber gloves, tubing and rubber drains is not to be passed over too lightly. It would seem a good procedure to be sure that these articles, if used dry, are free from excessive powder. It seems also that the inside of rubber gloves should not contain free powder in the finger tips, as a tear in the glove during operative procedure might liberate enough of the powder to cause serious lesions to develop.

The dusting of powder on raw surfaces should be eliminated as much as possible, and if used at all, the tissues should be observed for the development of any granulomatous lesion following its use.

Rectal and vaginal suppositories that have been kept in powdered talc or lycopodium should be freed from this powder before insertion. Following the use of these suppositories, it might be well to keep in mind the possibility of nonhealing granulomatous lesions developing from the spores or crystals.

SUMMARY

Two cases of granulomatous inflammation caused by spores of lycopodium powder and three cases of granulomatous inflammation caused by crystals of magnesium silicate are herewith presented. It is thought advisable again to

call to the attention of the medical profession the fact that serious lesions can be produced by indiscriminate or excessive use of these substances in abdominal or other surgery and by the use of rectal and vaginal suppositories. A brief review of the literature on the subject is also presented.

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RÉSUMÉ

Inflammation granulomateuse due à l'irritation de corps étrangers irritants

Deux cas d'inflammation granulomateuse consécutive aux spores de poudre de lycopode et trois cas dûs aux crystaux de silicate de magnésium sont rapportés. L'emploi immodére ou excessive de ces substances en chirurgie abdominale ou autre et leur emploi comme enrobage de suppositoires vaginaux ou rectaux est à déconseiller. Une revue brève de la litérature du sujet accompagne la communication.

ZUSAMMENFASSUNG

Granulomentzündung hervorgerufen durch Fremdkörperreiz

Der Verfasser veröffentlicht 5 Fälle von granulomatöser Entzündung von denen zwei durch Partikel von Likopodiumpulver und drei durch Magnesium Silikat hervorgerufen wurden. Er betrachtet es für ratsam die Aufmerksamkeit der Aerzte wieder auf die Tatsache zu richten, dass ernstlicher Schaden durch die unrichtige Anwendung dieser Substanzen in abdominaler und anderer Chirurgie, oder durch die Anwendung von rektalen oder vaginalen Suppositorien eingerichtet werden kann. Ein kurzer Literaturüberblick über dieses Gebiet wird ebenfalls geboten.

SUMARIO

Inflamación granulomatosa producida por cuerpos estraños irritantes

Dos casos de inflamación granulomatosa causada por esporos de polvos de licopodium y tres casos de inflamación granulomatosa causada por cristales de silicato de magnesio son presentados aquí. Se llama la atención nuevamente á la profesión médica la verdad de que lesiones serias pueden ser producidas por el uso indescreminado ó en exeso de estas substancias en cirugía abdominal ó otra clase de cirugía y por el uso de supositorios rectales ó vaginales. Una reseña breve de la literatura en la materia es presentada.

RIASSUNTO

Infiammazione granulomatosa prodotta da irritazione dai corpi strani

Sono presentati due casi d'infiammazione granulomatosa prodotta da spori di polvere di licopodio e tre casi d'infiammazione granulomatosa prodotta da cristalli di silicato di magnesio. Si è creduto utile chiamare all'attenzione della professione medica il fatto che lesioni pericolose possono essere prodotte con l'uso indiscreto o eccessivo di queste sostanze nella chirurgia addominale o nella chirurgia di altre parti del corpo, e coll'uso di suppositorii rettali o vaginali. E anche presentato un piccolo riassunto della letteratura su questo soggetto.

MAINTENANCE OF CONTINENCE IN OPERATIONS FOR CARCINOMA OF THE RECTUM

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PATIENTS who survive an operation for carcinoma of the rectum without recurrence but who are nevertheless unable to enjoy life because of incontinence for the remainder of their lives caused me to analyze the results of the manifold procedures in vogue and to endeavor to evolve some method for avoiding this distressing situation.

Of course, radical operation is to be considered as the main objective in all cases of malignancy of the rectum. My impression is that frequently continence is being sacrificed in cases in which it could have been spared.

First, we must consider the extent of involvement of the rectum by the malignant process; second, it is well to compare the mortality with the lasting results of the operation of amputation of the rectum in which the sphincter recti was saved; and finally, one must be acquainted with the methods for safeguarding continence as a primary or secondary procedure.

With reference to the question of choice between the dorsal approach or the combined operation, I have pointed out repeatedly and advocated the dorsal method which yields better results both as to the radicality of the operation as well as to its lower mortality.

EXTENSION OF CARCINOMA OF RECTUM

Winkler was able to show, several years ago, that a rectal carcinoma situated under the mucous membrane extends much higher than would appear macroscopically. Such extension of the tumor may reach a height of even 8 cm. above the tumor. It may also penetrate all layers of the intestinal wall, or the tumor may surround the circumference of the intestine and extend into the perirectal tissues. Winkler therefore concluded that under such conditions resection of the intestine should extend on both ends as far as possible into healthy tissue. The conclusion to operate radically in the horizontal direction as well was already made in 1929. At that time I published a statistical study of 1,000 radical operations for carcinoma of the rectum,[1] in which I stressed the necessity of radical extirpation and proper technical procedures. In the same communication a study of the tissues was made and the final results recorded of patients operated on 14 years ago. It was revealed that among the lasting results, not only the length of the removed intestinal segment was of deciding importance, but that such happy results could also possibly be attributed to the removal of sufficient tissue at the horizontal level of the neoplasm. I made a plea at that time for extension of the radical operation to include the horizontal diameter of the tissues involved.[2] Of further importance appear to me in this respect the painstaking pathologico-anatomic studies published by Westhues in 1930. He concludes as follows:

1. Cancerous connective tissue and lymph node metastases are situated at the level of the carcinoma or above it, practically exclusively, in the neighborhood of the superior hemorrhoidal artery.

2. Below the carcinoma the intestines and particularly the lymph gland tissue

and the connective tissue around the colon are usually healthy.

The conclusions to be drawn by the surgeon from these observations are clear: *Wherever possible, in situations in which the tumor is at a sufficient distance from the sphincters, these should be saved.*

LEVEL OF MALIGNANT PROCESS

The question as to the level at which carcinoma of the rectum is situated is, therefore, of importance in this connection. In 1922 I examined 655 tumors at the Hochenegg Clinic in Vienna for the purpose of ascertaining the location of these malignancies.[3] The positions of these were as follows: 192 (29.3 per cent) were situated in the pars analis recti at a distance of about 4 cm., 292 (44.8 per cent) at a distance of about 5 to 10 cm., 99 (15.5 per cent) 11 to 14 cm. high, allowing the bare possibility of reaching it with the finger, and 72 (10.8 per cent) were located over 14 cm. above the sphincter.

Based on this statistical study, we can therefore conclude that theoretically, at least, in more than 70 per cent of cases operated upon for carcinoma of the rectum, there exists a possibility of saving the sphincters. This, however, was done in fewer cases. In retrospect, I fail to find why attempts to save the sphincters by resection were not more often made. In 1922 I observed that among 461 operations for carcinoma of the rectum, in 227 the sphincters were saved. The mortality was 14.4 per cent.

Perhaps because in Küttner's Clinic the same results were obtained in regard to mortality of resections as compared with amputations, it is probable that the cases offering less technical difficulties were resected and that in cases in which the carcinoma had already infiltrated and hence were adherent to the surrounding tissues, amputations were done. At any rate, it may be stated that resection does not augment the operative mortality.

RESULTS

Finally, one more question arises: Does the saving of the sphincters influence the lasting results adversely?

The lasting results following operations for carcinoma of the rectum from the Hochenegg Clinic, of which I reported over 1,000 cases in 1929, discloses that following amputations and extirpations of the rectum, lasting results after three years reached a level of from 25 to 31 per cent, while after resections the percentage ranged from 33 to 37.

Similar results were obtained about the same time by Eichhoff (Küttner Clinic) and Pribram (Payr Clinic). A total of 1,350 operations performed at the three mentioned clinics offered proof that saving of the sphincters does not, in general, lessen the lasting result, provided, however, that the position of the carcinoma is sufficiently high.

It should also be mentioned here that circular suture of the intestine yields only 20 per cent of primary continence. This result can be brought up to 50 per cent by proper technic. Much better results in regard to continence can be obtained by the "pulling through" method of Hochenegg, which resulted in continence in 60 per cent of the operated patients who left the hospital. According to my recent experiences, by additional minor secondary procedures, the percentage may be augmented to 65 per cent and even more.

I believe that by stating the foregoing facts I have shown that there is no reason to fear attempts to retain continence because of operative mortality or lasting results. I wish now to discuss the technical problems with which the surgeon is confronted.

TECHNICAL PROBLEMS

I shall point out the steps for retention of continence as I practice them. They are as follows:

(A) *First Steps.* Wherever we endeavor to save sphincteric function, we begin with a *colostomy.* I prefer a double barrelled transversostomy. The intestinal segments are sutured to each other for a length of about 8 to 10 cm.; this is done in order to be able later to close the colostomy stoma by means of spur crushing forceps and thus obviate another operative procedure. The colostomy limbs are thoroughly exteriorized, "riding" on a rubber tube which is drawn through in the usual manner.

(B) *Radical Operation.* This may be performed by the sacral route, resorting either to the electric method (Keysser, Thorek) or by the usual scalpel method. If the carcinoma is situated above the sphincter (about 4 to 5 cm. are sufficient without endangering the radicality of the operation), the sphincter must be respected and not injured during the procedure. Open the pouch of Douglas. Free by dissection

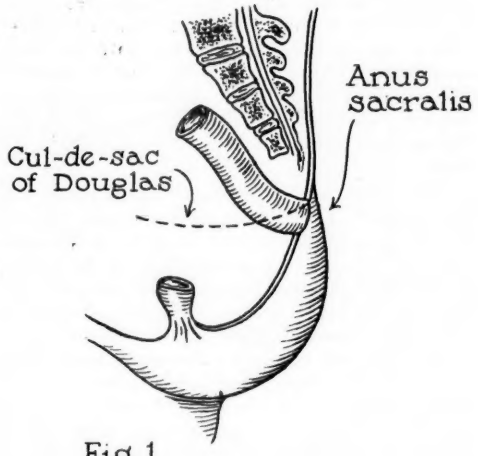

Fig. 1

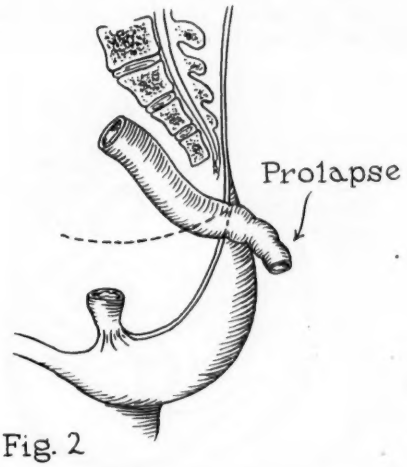

Fig. 2

Fig. 1. After resection of coccyx and sacrum, an anus sacralis was performed. The carcinoma was removed and the sphincters retained. The pointed horizontal lines indicate the culdesac of Douglas.

Fig. 2. A spontaneous or induced prolapse at the anus sacralis resulted.

One should never omit examining the liver and the high accessible lymph nodes for possible metastases. It should also not be forgotten to note carefully how high the tumor is placed in the abdominal cavity, and, what is of equal importance, whether the descending colon and sigmoid are of the long, looped or short variety. These are very important points to observe preceding the sacral operation to be performed.

On the sixth day the colostomy is opened, care being exercised that the accumulated fecal masses in the peripheral part of the rectum are thoroughly emptied by irrigations; this is usually easily accomplished where a high degree stenosis exists.

After thorough cleansing of the lower intestinal segment, repeated disinfections of the peripheral part of the intestine must be resorted to again and again. We know, of course, that complete bacterial disinfection here is illusory. Experiments in this respect, using thymol, etc., yielded negative results. However, I prefer the usual antiseptics diluted to such a degree that neither injury nor irritation of the intestinal mucosa or contiguous surfaces will result.

as much healthy intestine as possible. In the majority of cases 30 to 50 cm. of intestine may be mobilized. After having ascertained macroscopically and without pinning too much faith on the uncertain anatomy of the "critical point," that the intestine is "viable" (color, anastomosis), the next step is to join the central and peripheral stumps of the intestine by an end-to-end method. The usually practiced circular suture yields, on the whole, bad results. It is much more practical and successful to pull the proximal part of the intestine through the sphincter after having dissected off the mucous membrane from the sphincteric part of the gut (Hochenegg). It is of utmost importance that the intestinal segment pulled through must be free from any kind of tension. By using force one will never be able to execute a successful "pulling through" operation. If one proceeds as outlined, the retention of sphincteric continence is in the main assured. If, however, there is too much

tension, or the proximal part of the intestine is too short, the sphincteric portion of the bowel should be left behind, an anus sacralis being created in such instances at the end of the extirpated coccyx or sacrum (Fig. 1).

(C) *Secondary "Pulling Through Method."* Experience teaches that at times prolapse of the rectum may develop at the site of the sacral anus (Fig. 2). Paradoxically, often such a prolapsus has been removed by operation, instead of utilizing it to get continence. Weil (1918) was the first to describe a method to turn over such a prolapse akin to a gloved finger and to pull it through the remaining sphincteric part of the rectum. This method may be called the "secondary pulling through method."

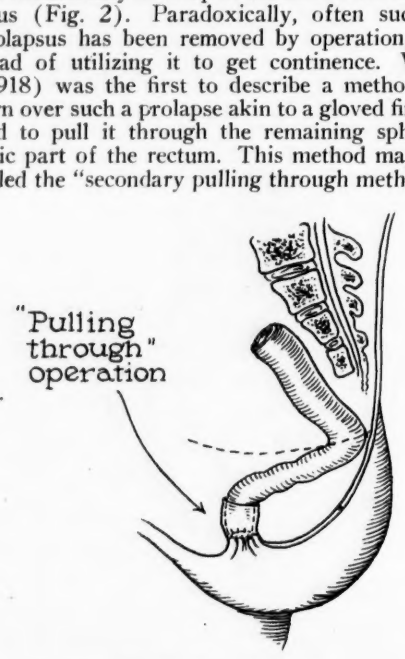

Fig. 3

Fig. 3. A "secondary pulling through" operation was done, as described in the text. The everted end of the prolapse is pulled through the sphincter muscles and retained in place by sutures.

The prolapsed bowel is turned over as in an ordinary rectal prolapse operation of the Rehn-Delorme type. Naturally, not only the mucous membrane, but all intestinal layers must be everted. The everted intestine is now wrapped in a moist piece of gauze and the second phase of the operation, consisting of tunnelling of the peripheral segment of the intestine, is performed as follows:

If the first phase of the operation was performed a long time ago, the peripheral part of the intestine is much stenosed or it may even be totally obliterated. Under such circumstances a large circular piece from the upper end of the peripheral intestinal segment has to be excised. In so doing, do not spare the tissue but be liberal in the dissection; in order to avoid a secondary stenosis after the "pulling through," the opening must be adequate.

The third step of the operation consists of denudation of the sphincteric part of the anus from mucous membrane, in order to create raw surfaces which will unite. Exact hemostasis is essential. After the tunnelling is completed, the "pulling through" step is performed (see fig. 3).

(D) *Formation of Rectal Prolapse.* In 1925 I pointed out that while performing the radical operation and afterwards, prolapse formation of the sacral anus can be produced artificially.[4] Certain existing factors lend themselves appreciably to the formation of such rectal prolapse. These are: insufficiency of the soft and bony structures of the pelvic floor; low position of the pouch of Douglas; insufficiency of the suspensory apparatus of the rectum; and finally, deliberately augmented action of the abdominal wall.

The first three conditions enumerated may be present at the primary operation for the rectal carcinoma, or they may be deliberately created. The coccyx or a portion of the sacrum is removed and the tissues composing the soft floor of the pelvis of the perineum are thus designedly weakened in its fulcrums by the operation. The soft tissues of the suspensory apparatus of the rectum are also injured by the mobilization of the intestine. Finally, after the pouch of Douglas is opened and after the intestine is properly mobilized, the suturing of the peritoneum of the fold of Douglas and the prolapsed, mobilized part of the intestine may be performed as deep as desirable.

Thus the three predisposing factors for the formation of a rectal prolapse are purposely created during the operation. As to the increased abdominal pressure, I advise my patients, if I desire to create an artificial prolapsus, to contract the abdominal muscles for considerable periods several times a day in a manner as if straining at stool, thus compressing the bowels. Also, by means of sondage of the sacral anus with bougies and by the use of a suction apparatus repeatedly, the early formation of a bowel prolapse can be enhanced.

In the case cited by me as an example elsewhere[4] the prolapsed bowel made its appearance one month following the radical operation. Two months after the operation the prolapse measured 10 cm. in length, while three months after the operation it attained 15 cm. in length.

When the prolapse has attained the desired length, it is turned over like the finger of a glove, the proximal portion of the peripheral portion of the intestine which often is stenosed or obliterated by the healing process is opened

by a circular, rather wide excision of the scar tissue and the prolapsed intestine is pulled through the sphincter in the same manner as described above. This is followed by physical therapy in the form of sphincter muscle exercises and eventually electric treatments in order to hasten the resumption of sphincteric control.

It should be noted parenthetically that the formation of a prolapse from the sacral anus should be encouraged even when it was impossible to preserve the sphincter muscle, because such an everted prolapse can later be used in certain instances for the creation of an anus glutealis which permits continence while the patient is standing and contracting the gluteal musculature.

many cases excessive stretching of the intestine may be avoided and thus excessive pull on the intestine endangering the nourishment of the bowel frustrated (Figs. 4 and 5).

The "elevation of the perineum" can be resorted to in the primary "pulling through" method as well as in the secondary drawing method which has been described.

The "elevation of the perineum" is accomplished by means of sutures, which engage, to the right and left of the sphincter, perineal tissue layers and connect them with the soft structures which are situated on both sides of the resected portion of the sacrum. Also, an attempt may be made to unite the soft tissues to the periosteum of the remaining sacral stump

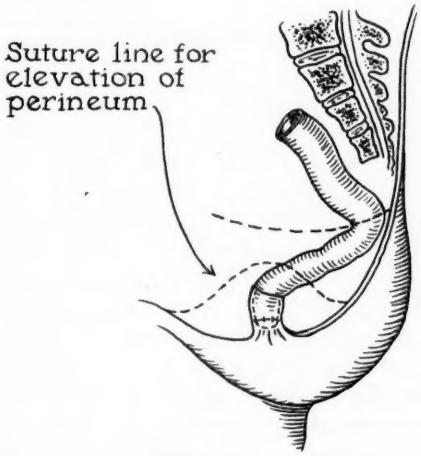

Fig. 4

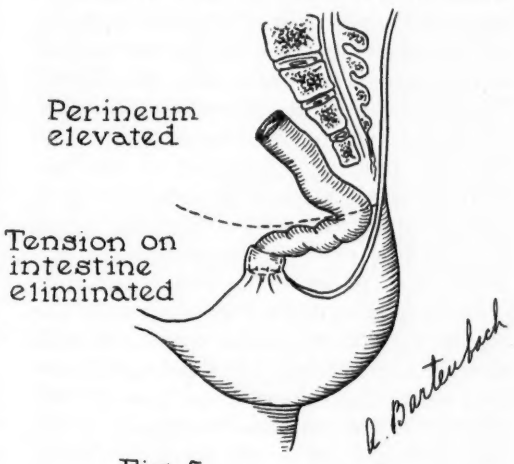

Fig. 5

Fig. 4. Since marked retraction of the everted prolapse resulted because of great tension, the perineum was elevated. The arrow points to the direction of the suture line. "Elevation of the Perineum."

Fig. 5. By reason of the elevation of perineum, the tension on the intestine is eliminated, the bowel again appears folded and thus able to heal to the sphincteric segment without risking the danger of gangrene.

(E) *Elevation of Perineum.* Finally, in 1935, I suggested a procedure by means of which the primary and secondary pulling through procedures were much facilitated. This procedure I designated as *"elevation of the perineum."*[5] The principles involved here are simple. The idea is based on the fact that if the mobilization of the intestine toward the sphincter is not successful, it may be possible to move the soft structures of the pelvic floor upward, toward the proximal portion of the intestine. By so doing, a distance of about 5 cm. may be gained. After resection of the coccyx or sacrum and after incising the sacroiliac ligaments and opening the culdesac of Douglas and mobilization of the rectum, and finally, after dorsal division of all soft tissues, the pelvic floor becomes a movable, soft segment, which can be displaced up or down as desired. In by means of these suspension sutures. The procedure consists of suturing of a longitudinal wound transversely as is practiced in pyloroplasty. The elevation of the perineum should be kept up from one to two weeks until the danger from tension of the mobilized intestine has passed.

GENERAL REMARKS

All operations for carcinoma of the rectum which aim at complete removal of the affected segment of bowel with sacrifice of the sphincters are technically rather simple in experienced hands, it is conceded, and the after treatment is much simpler than in the methods under discussion. Again, in the "pulling

through method" care has to be taken that the pulled through part of the intestine retains good nutrition. This applies particularly to the "primary drawing through method." Avoidance of tension in the area of the drawn through intestine is a *condition sine qua non*. Here, as well as in the secondary end-to-end suture procedures, in which, as is known, at first only anterior superficial sutures are placed, a secondary operation being performed later, one has to expect the development of fistulas, which often try the patience of the surgeon and patient alike. Frequent changes of dressings, which must be carried out with meticulous care, are essential. Troublesome fistulization can easily be overcome by proper treatment. The fact that the mucous membrane of the rectum possesses a great tendency towards regeneration and grows together again and again, even in unexpected situations, is of great aid in this connection. The tendency of the mucous membrane of the rectum might be compared with that of the urethra after prostatectomy and with the regenerative powers displayed by the mucous membrane of the bile passages following intricate operations.

Where a tendency for stenosis is manifest, meticulous examination and observation are necessary. To overcome such tendencies it is best not to resort to dangerous bougies or lamination but not to close the temporary stoma in the colon before normal conditions exist in the sphincter area.

In recent years I have resorted to packing the raw surfaces with oiled gauze which resulted in undisturbed healing. At first I used Metuvit oil, but I found the results were much better when I used any substance containing cod liver oil. While the various uses of cod liver oil are known, I am convinced of its efficacy under these circumstances. I am using cod liver oil gauze strips in primary operations as well as for drainage of the sacral cavity. It serves excellently for drainage and in supporting the intestine and even the sphincter itself. Such strips protect the intestine against dryness, and if loosely inserted, act as an efficient antiseptic, because of the noteworthy vitamin A and D content.

Simple gauze strips or a wick may be used. I pour cod liver oil into these large wound cavities and quite often rapid healing results, even of large cavities caused by dehiscence of sutures in this region.

CONCLUSION

In conclusion, I should like to point out: The development of operative procedures for carcinoma of the rectum dates back to 1739 when Faget on June 7th of that year operated first for rectal cancer. The first operation with opening of the peritoneal cavity was done on February 13, 1826, by Lisfranc, whose method was later improved by Velpeau, Dennonvilliers and Verneuil. A great step forward was accomplished by Kraske in resecting the sacrum; this was modified by Hochenegg. Preliminary colostomy was introduced by Berard, Choalier and Schede. Combined operations were advocated in 1877 by Volkmann. The first successful combined operation was done by Jeannel in 1891. He saved at that time the sphincter. Further contributions to the further development of this type of surgery were made by Quenu, Gaudier, Chalot, Hartmann, Mamsell, Trendelenburg, Kraske, Mayo. In recent times the advances in technic were developed by Miles, Bartlett, Schmieden, Kirschner, Lockhart-Mummery, Rankin, Jones and others.

Electrosurgical technics were elaborated on by myself, Keysser and Thorek. Nevertheless, despite all these noteworthy advances, a certain impasse has now been reached akin to the results obtained following operation for carcinoma of the stomach or breast. What

the future holds in store is difficult to divine.

Finally, if the surgeon will recall that a person with an incontinent sphincter is often unfitted for work and on occasion is socially ostracized and suffers from a train of psychoneurotic manifestations incident to the existence of this condition, he will bend every effort to retain, if at all possible, sphincteric control. It is to that end that this article was written.

SUMMARY

The history, evolution and statistical data of operations for carcinoma of the bowel with retention of the sphincters are discussed. A number of technical details and the author's original contributions as well as modifications of time-honored procedures are described and evaluated. The value of cod liver oil dressings is pointed out and a plea for retention of sphincteric function, when possible, is stressed.

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RÉSUMÉ

Le maintien du controle après les opérations pour le cancer du rectum

L'auteur discute l'histoire, l'évolution et les données statistiques des opérations pour le cancer du rectum avec rétention des sphincters. Il avance des détails de technique et aussi ses propres contributions à l'avancement du sujet. Il décrit et évalue certaines modifications apportées aux procédés classiques. Il préconise les pansements à l'huile de foie de morue et recommande la retention des sphincters.

ZUSAMMENFASSUNG

Erhaltung der Kontinenz bei Operationen für Rektumkarzinom

Die Geschichte, Entwicklung und Statistik der Darmkarzinome Operationen, bei denen der Sphinkter erhalten bleibt werden erörtert. Eine grosse Anzahl sowohl technischer Einzeilheiten und des Verfassers Beiträge als auch die Modifikationen der alten Prozeduren werden beschrieben und gegeneinander abgeweckt. Der Verfasser legt besonderen Nachdruck auf den Wert der Lebertronverbände und betont die Wichtigkeit der Erhaltung der Sphinkterfunktion, wenn irgend wie möglich.

SUMARIO

Mantenimiento de la continencia en las operaciones por carcinoma del rectum

La historia, evolución y datos estadisticos de operaciones por carcinoma de los intestinos con retención del esfinter son discutidos. Un número de detalles tecnicos y la contribución original del autor tanto como las modificaciones de los tiempos son descritos y evaluados. El valor del tratamiento local con el aceite de higado de bacalao es mecionado y la retencion de la funcion del esfinter es aconsejada.

RIASSUNTO

Il mantenimento della continenza in operazioni per cancro del retto

La storia, l'evoluzione ed i dati statistici sulle operazioni per cancro dell retto, con retenzione delle sfinteri, sono discusse. Parecchi dettagli tecnici e le contribuzioni originali dell'autore ed anche modificazioni di antichi procedimenti sono descritti e valutati. Il valore di medicamenti fatti di olio di fegato di merluzzo è ben notato e l'autore milita in favore della retenzione della funzione sfinterica quando è possibile.

APPENDICULAR PYLEPHLEBITIS

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SAN FRANCISCO

THE problem of pylephlebitis as a complication of appendicitis is fortunately encountered infrequently in recent times. Increased accuracy in diagnosis, particularly of early diagnosis, therefore early operation, has been mainly responsible for this infrequency. Early operation before infection has had a chance to invade the tissues immediately adjacent to the appendix itself is more or less the rule in present day practice. The marked improvement in operative technique has also been a factor in reducing the incidence of pylephlebitis as a postoperative complication. Yet, in spite of these favorable factors, cases are still met with wherein, because of geographical distance and other environmental factors, too lengthy an interval has elapsed from the time of onset of initial pain to operation. Often a patient with lowered intelligence, coupled with a low pain threshold, waits to see if the pain will not subside without calling medical aid, and valuable time is thereby lost. Then again there is error on the part of the physician himself, who compromises with his judgment and allows too long an interval of expectant therapy; operation is hopelessly postponed and the patient is thereby unjustly exposed to great danger.

FIRST DESCRIPTIONS OF PYLEPHLEBITIS

It is indeed instructive to read Fitz's original description of inflammation of the vermiform appendix published in October, 1886. In this article he relates the tremendous controversy which existed at that time as to whether the infection present was not one involving the cecum alone, the appendix being entirely free of inflammation, or vice versa.

Fitz was a pathologist and supposedly not a clinician, yet he was often enticed onto the surgical wards and his opinion and advice sought, particularly in cases in which the pathology was located in the right lower quadrant of the abdomen. In that early day, he made the diagnosis of pylephlebitis complicating appendicitis many times and proved his diagnosis correct at autopsy, which was an all too frequent occurrence in those days. His description was as follows:

> "The occurrence of disease of parts remote from the region of appendicular inflammation must be alluded to, such as abscesses of the liver from pylephlebitis or portal embolism in consequence of a mesenteric thrombo-phlebitis near the appendix. The affection of the liver and portal vein may be the result of a direct continuance of the phlebitis or may follow putrid embolism from a thrombus in the immediate vicinity of the appendix."

It is of passing interest that in this first description of appendicitis, Fitz[1] issued a warning against the use of laxatives:

> "A cathartic or a laxative may be demanded by the patient or his friends and an enema be thought desirable as a diagnostic aid. It is to be remembered that these may be the means of at once exciting a general peritonitis."

Twenty years later, Gerster[2] called attention to pylephlebitis complicating appendicitis and made the following statements:

> "It seems clear that, as regards purulent pylephlebitis caused by appendicitis, an early diagnosis of the primary trouble and prompt operation offer the only reliable safeguards.

"The occurrence of a chill is of the gravest importance and should be considered to constitute a more urgent indication to operate than even the signs of local peritonitis. Where much necrosis is found, it would be very desirable to expose and evacuate thrombosed veins.

"The evacuation of septic thrombi from the jugular vein in mastoid disease has yielded such excellent results that the application of the principle to the portal vein would be natural and logical."

This latter recommended procedure has been tried but discarded by many surgeons for reasons which will be explained later in this paper.

Pylephlebitis is the term used to indicate thrombophlebitis of the portal vein or portal system. It is most commonly associated with acute appendicitis and is frequently the postoperative complication of acute appendicitis. Unfortunately, over a period of years there has arisen a tendency to speak of pylephlebitis and liver abscess synonymously, which is erroneous. It does not necessarily follow that if pylephlebitis is present, a liver abscess will result.

ETIOLOGY

There has been considerable difference of opinion among pathologists as to exactly what tissue changes take place in this entity, but there has been an even greater conflict of opinion as to exactly how they take place.

This difference of opinion may occur because of an overzealous desire to catalog the disease into one card indexed description, when it is obvious that such a classification is practically impossible. This is more obvious when it is realized that such a type of infection will not follow any definite rule or path but will be more or less dependent upon chance or accommodation to whatever factors may be present locally which form a path of least resistance.

A few facts are known rather definitely and can be set down as categorically true.

The first of these is that appendicular pylephlebitis may be an accompaniment or a postoperative complication of suppurative appendicitis. Secondly, delay in operation is a predisposing factor to its occurrence. Thirdly, the case in which chills have occurred and in which at operation an angry extensive inflammatory process is found should be viewed with grave suspicion as a potential pylephlebitis. Fourthly, following appendectomy, chills, fever, abdominal tenderness and distension occurring at any time from the second postoperative day on should bring immediately to mind the possibility of this complication.

The conflict of opinion as to the method of production of pylephlebitis centers about whether the process develops by direct extension from the original suppurative area, the appendix, or by way of the lymphatics, or whether it is due to thrombosis or thromobphlebitis of the vessels of the meso-appendix with subsequent loosening of the clot, a single embolus or multiple emboli being sent along the cecal branches of the right colic vein and thence to the portal vein. Another opinion is that pylephlebitis occurs as the result of a gradual extension of the suppurative process through the loose retrocecal areolar tissue upward toward the liver.

It is reasonable to suppose that not one but all of these processes take place to some extent in these cases. The matter of retrocecal infection and cellular extension upward receives perhaps more prominence than it should. Although it is perhaps present in some of these cases, this anatomical situation in itself serves to bring the process into closer approximation to the small vessels which are more numerous in the retrocecal area; thereby they are more easily and more quickly invaded. Direct cellular extension of a suppurative process in this region is more prone to result in a subdiaphragmatic or subhepatic abscess.

If such a process became extensive,

particularly if severe peritoneal extension occurred and travelled by way of the lymphatics of the portal system and those of the retrocolic region, then the infection could easily be carried intrahepatically, and abscess formation, probably with multiple abscesses, would result.

It is only when the infection can and does invade the portal system that true pylephlebitis and true intrahepatic abscess can develop.

In this respect it is perhaps as well to reiterate that in every case all three avenues of possible causation are involved to some degree.

As evidence against the teaching that thrombosis of the veins is not a part of this entity, the fact is advanced that pathological studies of the meso-appendix, small vessels, and the tissue in the immediate vicinity invariably reveal no involvement of the vessels at the time of operation. The picture present at the time of operation may have no relationship whatever to that present when pylephlebitis occurs.

INDICATIONS FOR TREATMENT

Most often at operation there is absolutely no evidence, especially gross evidence, that such a process is present. Nowadays it occurs later, as a postoperative complication. Because of this it is possible to institute at the time of operation, in the suspiciously potential case, preventive measures which may be responsible for saving an occasional life. We probably shall never have a method of detecting whether recovery could be attributed to such a procedure or not. In cases in which there is gross cellular change involving a large peri-appendical area, with severe constitutional reaction on the part of the patient, particularly if there have been chills, a prophylactic ligation of the ileocolic vein in an area free from infection has been recommended by many authors. This procedure has been advocated in those cases in which there is much congestion and engorgement; extensive, inflammatory edema; cellular infiltration of the retrocecal structures; or a dirty-looking, greenish and reddened appendix with gangrene or abscess formation, on the assumption that such a case is potentially dangerous and suspiciously predisposed to pylephlebitis.

Inasmuch as the prognosis is definitely bad if pylephlebitis does occur, any step or technical procedure taken in advance in a laudable effort to prevent a catastrophy is justified. Every case of acute appendicitis should be considered a potential case of pylephlebitis, if it is ushered in with chills and if it presents the intraabdominal picture described above. The preventive procedure of ileocolic ligation should then be considered.

The clinical picture presented in these cases is invariably the same and usually takes place in the following manner.

In postoperative pylephlebitis, 48 or 72 hours following appendectomy, or even later, there occurs a chill or chills with a rapid rise in temperature to about 104°. The temperature then takes on the typical septic curve, down in the morning, up in the afternoon, with or without the recurrence of chills. The patient begins to present definite evidence of septic infection in his face and skin and by pulse elevation and respiratory increase, although the abdomen, particularly the right lower quadrant, may be soft and entirely free of spasm or rigidity of the musculature. Nevertheless, the patient has definitely the appearance of serious illness.

If the process is to extend along the portal system and involve the liver, there will appear a gradually increasing jaundice, with some tenderness and soreness over the liver area.

An enlarged palpable liver may or may not be present, depending entirely upon the size and location of the abscess formation in the liver.

TREATMENT

Braun,[3] Wilms[4] and many other surgeons long ago advocated the tying off of the venous supply in such cases, but in their cases they did this only after the complication had actually set in, a normal quick recovery. It is also recognized that the percentage of cases in which the possibility of pylephlebitis occurs is relatively small, yet these known facts should not mitigate against the use of any measure which holds the

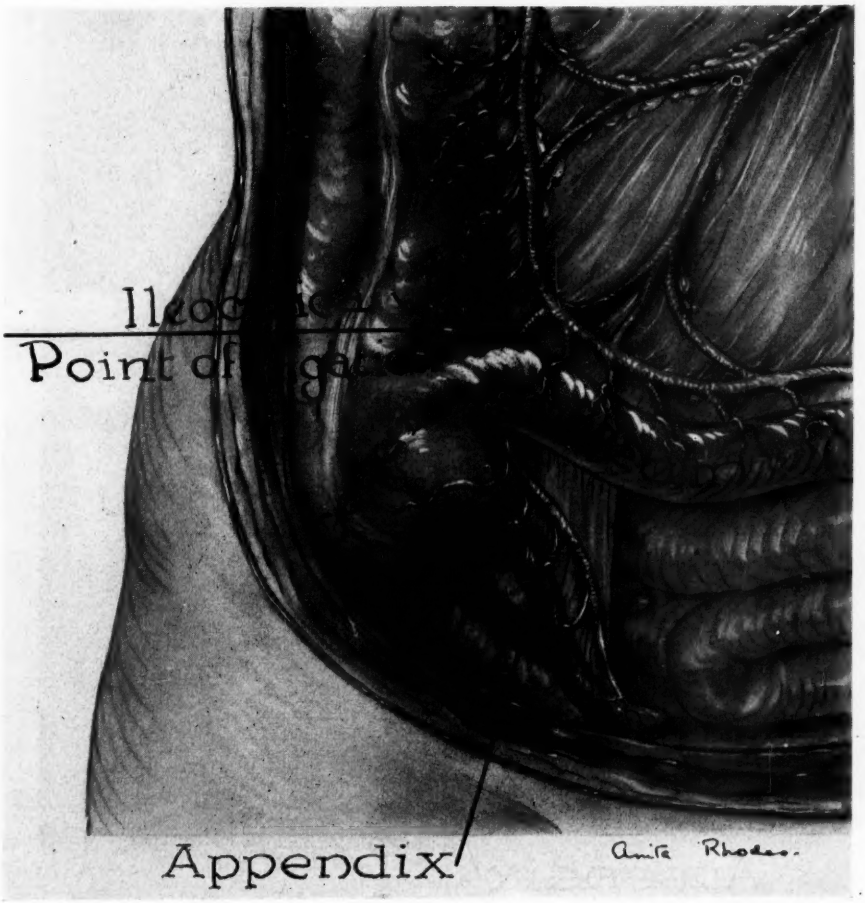

Fig. 1

time when the operative risks are definitely increased.

It is obviously true that in cases wherein a certain amount of mesenteric engorgement and vessel thrombosis was present, appendectomy has been performed a countless number of times without any subsequent hindrance to possibility of being a preventive in the rare case which does excite suspicion of being potentially that one in which pylephlebitis may develop.

In those cases in which much gangrene and necrosis are present and there is gross evidence of extensive thrombotic change in the veins of the meso-

appendix, then a slight additional amount of time taken out to include a prophylactic measure may possibly avoid a highly undesirable surgical intervention later, when the odds involved are heavily adverse.

The proposal of Braun[3] to ligate the ileocolic vein is not only a rational but a feasible one. He proposed it first as a therapeutic measure after the complication had occurred. In selected cases, the same procedure can be used as a prophylactic before the condition has occurred. The ileocolic vein is the only avenue by which thrombi may travel from the infected peri-appendiceal region to the liver and therefore this pathway can be cut off by ligation (Fig. 1).

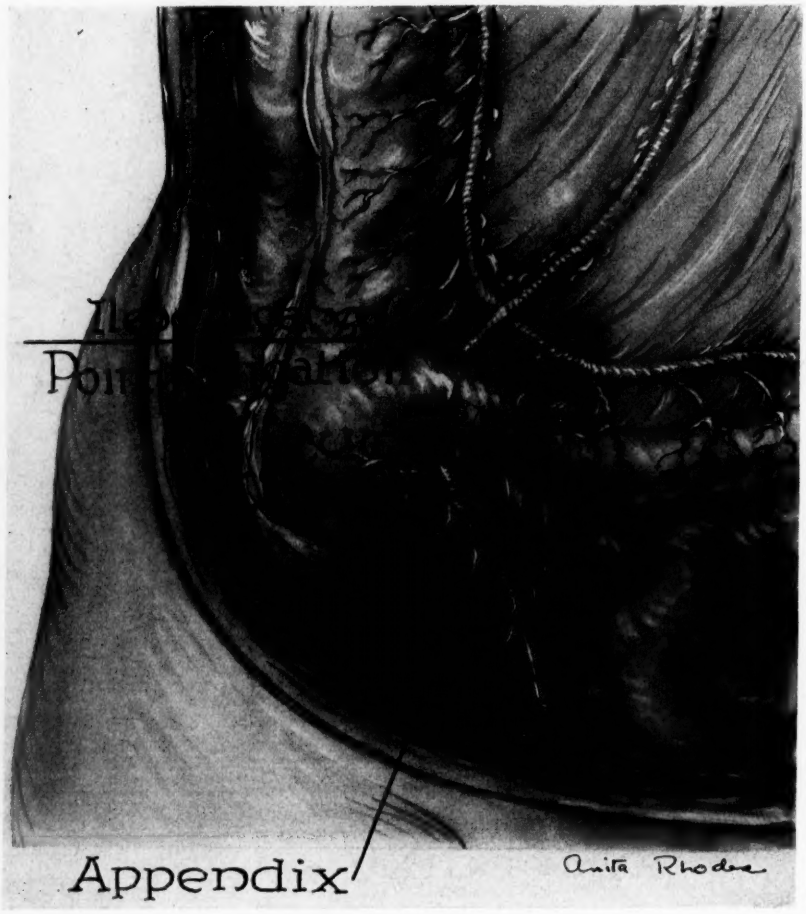

Fig. 2

Exposure and evacuation of the thrombosed veins has been proposed in the past, notably by Braun[3] and Wilms.[4] That this is technically difficult, time consuming, and not easily feasible, is obvious, as one could never be quite sure of cleaning out all venous channels.

In carrying out such a procedure of

ligation, it is well to bear in mind the possible anomalies of the ileocolic vein and its branches. Three main arrangements of the vein are most commonly encountered and can be more easily visualized by the illustrations (Figs. 2, 3, 4).

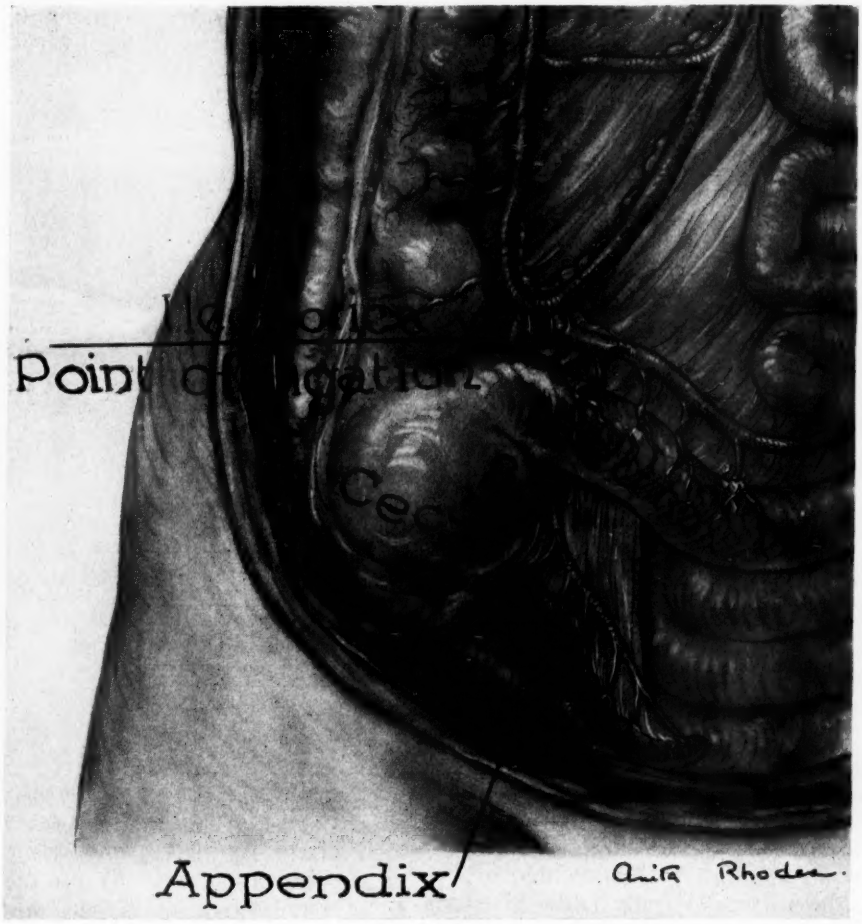

Fig. 3

It is obvious that all main divisions of the vein must be ligated in order that the procedure may be effective. Ligation of only one main branch when two or three were present would nullify the purpose and intent of the procedure. Preventive ligation is of infinitely more value than any procedure instituted, once the suppurative process gains the ascendancy.

The vein or its main divisions should be ligated well above any clot which may already be present within.

The criticism has been made that such a procedure entails the exposing of a raw surface in the immediate vicinity of a septic process, but it is believed that

Fig. 4

in the selected case the possible benefit fully justifies whatever the risk may be from such a source.

SYMPTOMATOLOGY OF POSTOPERATIVE PYLEPHLEBITIS

The greater problem is that concerning which cases should be selected as necessitating such an additional procedure. Such a problem is entirely an individual one, subject to the surgeon's observation of conditions present, his experience, his intuition or his susceptibility to hunch, which will frequently govern his action.

A. Temperature and Pulse. Chills during the convalescence from appendectomy, with a rapid rise in temper-

ature and a subsequent picket fence curve, accompanied by high afternoon rises most often signify a spreading of the infectious process from the appendix area into the nearby venous circulation. There then exists the possibility of subsidence of the process with a few days of chills, fever, sweating and constitutional intoxication, followed by a gradual daily lowering of the temperature and recovery. In the cases of greater severity and increasing involvement, the picture is that typical of a gradually intensifying, infectious process with intervening death of the patient. An alternative is the formation of liver abscess. This may be solitary or multiple, depending entirely upon the mechanical factors involved.

B. Leucocytosis. A persistent high leucocyte count throughout the course of the process is the rule.

C. Pain. This is not a constant or even a common symptom. The usual amount of pain and tenderness expected in the right lower quadrant of the abdomen following appendectomy is not appreciably increased.

D. Distension. As the process extends, increasing difficulty, with abdominal distension and ileus, is frequently encountered.

E. Perspiration. Drenching perspiration, such as is encountered in any severe pyemic condition, is noted.

F. Icterus. When jaundice does occur, it indicates that the process has passed from the venous structures of the ileocolic vein into the liver, and that abscess formation has already occurred or is about to take place.

CONCLUSION

Ligation of the portal vein itself has been proposed by a few writers, notably Colp,[5] but it has been discarded on the basis that it proved of little value.

Surgical intervention after the complication has occurred is of lessened value. Tying of the ileocolic vein and of its main branches in the region of the ileocolic angle in those cases wherein it is believed that the conditions present are those conducive to pylephlebitis may serve as a procedure of value. Only time and increased trial will prove its efficacy.

Temporarily ligation of the ileocolic vein serves to ease the surgical conscience, and there is a satisfaction in having used foresight rather than hindsight in that case in which the complication may occur, despite the use of this measure.

It is indeed fortunate that these cases occur only rarely, due to medical education and medical consciousness on the part of the public, earlier and more accurate diagnosis on the part of the physician, earlier operation and a more precise technic on the part of the surgeon, but despite all of this, in the course of surgical practice there will occur a case in which the procedure described herein is indicated and should be used.

SUMMARY

Pylephlebitis, the term used to indicate thrombophlebitis of the portal vein or portal system, is most commonly associated with acute appendicitis and is frequently a postoperative complication. A chill occurs 48 or 72 hours following appendectomy, with rapid rise in temperature to about 104°. The temperature then takes on the typical septic curve. Ligation of the ileocolic vein is useful if carried out preoperatively. It is recommended as a prophylactic in cases in which there is much congestion and engorgement, extensive edema or cellular infiltration of the retrocecal structures, or in which the appendix is greenish and reddened, with gangrene or abscess formation.

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RÉSUMÉ

La pyelophlébite appendiculaire

Par ce terme on désigne une thrombophlébite de la veine porte ou du système porte. Fréquemment, cette condition est associée à une appendicite aiguë et survient souvent comme complication postopératoire. Quarante-huite ou soixante douze heures après une appendicectomie, le malade a un frisson et une ascension rapide de température qui peut approcher 104° F. La fièvre est de nature septique. La ligature préoperative de la veine iléo-colique est utile et est préconisée comme mesure prophylatique quand il y a une congestion ou un engorgement prononcé, un oedème exagéré ou une infiltration cellulaire des structures rétro-coecales, et aussi quand l'appendice est gangréné ou qui'il y a eu formation d'abcès.

ZUSAMMENFASSUNG

Appendikulare Pylephlebitis

Pylephlebitis bezeichnet eine Thrombophlebitis der Pfortader oder des Pfortadersystems. Sie ist meistens mit einer akuten Blinddarmentzündung verbunden und ist häufig eine postoperative Komplikation. Ein Schüttelfrost tritt 48 oder 72 Stunden nach der Appendectomie auf und die Temperatur steigt schnell auf ungefähr 40° C. Später verläuft die Temperatur in einer typisch septischen Kurve. Die Unterbindung der Vena ileocolica ist nützlich, vorausgesetzt, dass sie vor der Operation ausgeführt wurde. Sie wird auch als Prophylaxe vorgeschlagen in Fällen, in denen Stauung, ausgedehntes Oedem oder zellulare Infiltration der retrocoecalen Gebilde vorhanden ist oder in denen der Blinddarm ein grünliches und rötliches Aussehen hat und eine Gangrän oder Abscessbildung vorliegt.

SUMARIO

Pileflevitis apendicular

Pileflevitis, termino usado para indicar tromboflevitis de la vena portal ó sistema portal, es mas comunmente asociado con apendicitis aguda y frecuentemente una complicación pos-operativa. Un escalofrio ocurre 48 ó 72 horas despues de la apendicectomia, con elevación rapida de la temperatura al rededor de 40 grados. La temperatura toma un caracter típico de curva séptica. Ligación de la vena iliocólica es ventajosa si fué hecha preoperativamente. Esto es aconsejado como profilactico en el caso que halla mucha conjestion, edema extensivo, ó infiltración celular de la extrucuras retrocecales, ó cuando el apendice es verdoso ó rojizo, con gangrena ó abscesos.

RIASSUNTO

Pileflebite Appendicolare

Pileflebite, che è il nome usato per indicare thromboflebite della vena portale o del sistema portale, è ordinariamente associato con appendicite acuta ed è frequentamente una complicazione postoperativa. Un brivido di freddo occorre quarantotto o settantadue ore dopo l'appendettomia, con aumentazione rapida di febbre fino a 40° C. La tempera-

tura allora assume la curva tipicamente settica. La legatura della vena ileocolica è utile se è compiuta preoperativamente. Si raccomanda come un profilatico nei casi in cui c'è molta congestione e divoramento, edema estensivo, o infiltarzione cellulare delle strutture retrocecale, o in cui l'appendice è verdastra e rossiccia, con gangrena o formazione d'un ascesso.

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ACUTE INTESTINAL OBSTRUCTION

A STUDY OF THE DIAGNOSIS AND TREATMENT WITH AN ANALYSIS OF 104 CASES*

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INTRODUCTION

RECENT contributions to the therapy of intestinal obstruction make it timely to consider certain aspects of the problem which face the surgeon in the diagnosis and treatment of this disease entity.

The introduction by Wangensteen of a method for continuous duodenal suction and the development of the Miller-Abbot double lumen tube have altered many of our previous concepts of treatment. The present study is an analysis of 104 cases of acute intestinal obstruction treated at the Hospital for Joint Diseases, New York, from January, 1929, to January, 1938, and an attempt to correlate the pathology and pathological physiology with the symptom complex and the treatment of intestinal obstruction.

INCIDENCE AND CLASSIFICATION

For practical clinical purposes the simplest classification of intestinal obstruction is the most useful. We have divided our cases into two categories: (1) mechanical obstructions, and (2) paralytic or adynamic obstructions. The former group is further subdivided into two classes: (a) simple obstruction in which the lumen of the bowel is obstructed without impairment of the blood supply, and (b) strangulating obstruction in which the blood supply is interfered with but the continuity of the bowel is not altered, as in mesenteric thrombosis. In most of the cases

CHART 1

INCIDENCE OF CASES IN OUR SERIES COMPARED WITH THAT OF McIVER

	Our Series		*McIver's Series*	
	Cases	*Per Cent*	*Cases*	*Per Cent*
Strangulated external hernia	31	29.8	147	44.0
Adhesive obstruction	28	26.9	103	30.0
Neoplasm	15	14.4	32	10.0
Paralytic ileus	12	11.5	..	..
Volvulus	4	3.8	13	4.0
Internal hernia	3	2.9	3	0.9
Gall stone and foreign bodies	3	2.9	7	2.0
Intussusception	2	1.9	17	5.0
Postoperative eventration	2	1.9	..	..
Mesenteric thrombosis	1	1.0	9	3.0
Lymphogranuloma	1	1.0	..	..
Ileitis	1	1.0	..	..
Congenital anomalies	..	..	2	0.6
Meckel's diverticulum	..	..	2	0.6
Cause unknown	1	1.0	..	..
TOTALS	104	100.	335	100.

*From the Surgical Services of the Hospital for Joint Diseases, New York, N. Y.

of strangulating obstruction, however, both blood supply and intestinal lumen are blocked. We feel that this simple classification is sufficient, inasmuch as it forms the basis for treatment.

The incidence of the various etiological agents causing obstruction in our series is listed in Chart I. These figures closely parallel those reported by many authors[1,2,3]. The most frequent agents causing obstruction are constricting bands, strangulated hernia, and neoplasms of the bowel. No case of congenital obstruction was found in our series. Age and sex incidence are of little significance. In our series there were 54 males and 50 females. We noted a predominance of strangulated hernia in the males while cases of obstruction secondary to adhesive bands were more common in the females. This is undoubtedly due to the occurrence of pelvic inflammatory disease in the female. All age groups were found in this series, and, except for the occurrence of obstruction following carcinoma and strangulated hernia in adults, there were no significant findings.

A rather large percentage of early postoperative obstructions was noted. These usually followed appendicectomies. It was also observed that a large number of the cases of late adhesive obstructions occurred after operations for pelvic inflammatory disease. No cases of obstruction occurred after operations for suspension of the uterus.

CHART 2

CLASSIFICATION OF STRANGULATED HERNIAE

TYPE	*No.*	*Per Cent*	*Male*	*Female*	*Small Bowel*	*Large Bowel*
Inguinal	19	55.9	15	4	15	4
Femoral	9	26.5	4	5	9	0
Umbilical	3	8.8	1	2	3	0
Diaphragmatic	2	5.9	2	0	0	2
Foramen of Winslow	1	2.9	0	1	1	0
TOTALS	34	100.0	22	12	28	6

CHART 3

RELATION OF PREVIOUS OPERATION TO OBSTRUCTION IN ADHESIVE OBSTRUCTIONS AND ILEUS

Operation	**Early Post-operative*	*Late Post-operative*
Appendectomy	8	9
Pelvic operations in females	5	8
Operation for adhesions	1	..
Rankin resection of carcinoma of the sigmoid	..	1
For gall bladder disease	..	2
For umbilical hernia	..	1
For previous intestinal obstruction	..	2
TOTALS	14	23

No Previous Operation—3 cases

* Early postoperative obstructions are considered as those which showed evidence of obstruction within 4 weeks of operation.

PATHOLOGY

The pathological changes in intestinal obstruction can be directly attributed to disturbances in the normal physiology of the bowel occurring in a more or less characteristic pattern as a result of obstruction. Except for the strangulating type of obstruction, in which the sequence of events differs, one may assume that these alterations in the normal physiology of the bowel are the direct result of increased intraluminal tension. In fact, it has been shown[4,5] that these changes occur in direct proportion to the increase in this tension.

Increased intraenteric pressure affects the peristaltic action, the secretions of and the absorption by the mucosa, the bursting of strength of the bowel and the

permeability of the wall; in addition, it has a direct effect on the circulation of the blood through the bowel wall. Wangensteen[2] has shown that the distension in intestinal obstruction is largely due to two factors: swallowed air and gastrointestinal secretions. Slight degrees of distension cause an increase in the secretions of the gastrointestinal tract either as a result of reflex secretory stimulation through Auerbach's plexus or as a result of an increase in capillary permeability. This increase in secretion causes a further increase in the distension of the bowel and a vicious circle ensues. In addition, absorption from the distended bowel is greatly diminished. Some observers have noted a decrease of 90 per cent in the absorption of water from the distended bowel. This factor contributes further to the distension. One of the effects of this increase in distension of the bowel is an increase in the peristaltic activity, which is noted early and accounts for the presence of intestinal colic, the predominant symptom of intestinal obstruction.

The above sequence of events interferes greatly with the circulation through the bowel wall. Due to anatomical variations in the blood supply to the bowel[6] the effects on the circulation vary, depending on the site of obstruction. In the upper small bowel the blood vessels enter the bowel between the muscular and mucosal layers and are therefore easily compressible, whereas in the large bowel the vessels enter outside the muscular coat and are compressed with greater difficulty so that the effects of compression occur much later. The blood flow through the bowel wall may be said to decrease in direct proportion to the increase in the intraluminal pressure, although it probably never ceases completely. Gatch was able to show some venous blood flow regardless of the degree of pressure exerted on the walls of the bowel.

This diminution in blood flow which is caused by the physiological alterations in the distended bowel is in turn the causative factor in the pathological changes which ensue. With a moderate increase in the intraluminal pressure, slight congestion and dilatation of the capillaries appears. This is followed, at slightly increased pressures, by extravasation of blood into the tissue spaces and into the lumen. At this time there may also be a mononuclear cellular infiltration into the submucosa. The next stage will usually show a polymorphonuclear infiltration which is then followed, if the distension persists, by necrosis, and gangrenous areas appear in all layers. The asphyxia of the bowel wall is further aggravated by absorption of oxygen from the stagnant blood, which, incidentally, forms an excellent culture medium for bacteria which invade the asphyxiated tissues. These changes occur rapidly at high levels of intraluminal pressure. A pressure as low as 10 cm. of water exerted over 24 hours may cause petechial hemorrhages, while a pressure of 20 cm. of water over the same period of time will cause gangrene of the bowel wall[5]. It has been shown clinically that in intestinal obstruction the pressure may be from 4 to 19 cm. of water in the small bowel and from 12 to 52 cm. in the large bowel[7].

It is doubtful, in view of the work of many observers, whether penetration of the wall of the bowel by noxious substances can occur in the absence of tissue necrosis[2,8,9]. Similarly, absorption of bacterial toxins into the blood stream is increased with diminished viability of the bowel wall. The occurrence of peritonitis in obstruction is usually a terminal phase and indicates beginning or advanced necrosis of the intestinal wall. Bacteria will not penetrate into the peritoneal cavity through the normal mucosal lining of the intestinal tract[11]. When distension is present with its re-

sulting sequelae, permeability is increased until a frank perforation occurs. Even without frank perforation, however, bacteria will penetrate and the importance of this factor in the prompt relief of distension and the careful handling of damaged bowel at operation cannot be overestimated.

In obstructions of the strangulating type the sequence of events varies considerably from that described above. In these cases the factor determining the pathological changes which occur is the direct occlusion of either the mesenteric arteries or veins, or both, by the strangulating mechanism. As demonstrated by Scott[4] and Donaldson,[12] the changes in the bowel wall will vary depending on whether the strangulation is primarily arterial, venous, or both.

If the arterial supply to the bowel is blocked, as in mesenteric thrombosis, the bowel becomes lusterless and dark purple in color. Distension is not marked, but some bloody fluid is present in the lumen of the bowel. This will progress to anemic or hemorrhagic necrosis of the bowel wall. If the bowel wall is intact, only small quantities of fluid are found in the peritoneal cavity and this fluid will usually have a hemoglobin content of less than 10 per cent. After necrosis of the bowel has occurred, the peritoneal fluid is foul smelling and bloody.

When the circulatory obstruction is principally venous, the bowel is markedly distended with bloody fluid and the wall of the bowel is infiltrated with red blood cells. As the distension increases, necrosis occurs, and the peritoneal fluid, which is usually very bloody, and has a high hemoglobin content, increases in amount. When both the artery and vein are obstructed, as occurs in obstruction due to adhesive bands or volvulus, the picture is usually that of the venous type unless the arterial blood flow has been completely cut off.

The loss of blood into the lumen of the intestine or peritoneal cavity in venous vascular occlusion may be very marked and induce a state of exsanguination. This must be corrected by massive transfusions before proceeding with other treatment. When the arterial wall is blocked, blood loss is a comparatively minor factor.

The degree of increased intraluminal pressure necessary to cause the pathological changes described varies considerably, depending on the location of the obstruction and the length of time during which the increased pressure has acted. The bowel, as other hollow viscera, can accommodate itself to gradually increasing pressure. Clinically, pressures of 4 to 30 cm. of water have been found in obstruction of the small intestine and between 12 and 52 cm. in obstruction of the colon. Whereas a pressure of 10 cm. of water exerted over a period of 12 hours may cause congestion and dilation of the capillaries of the bowel wall, in 48 hours petechial hemorrhage and necrosis may occur. The importance of this factor in early diagnosis and treatment cannot be overestimated.

SYMPTOMATOLOGY

The clinical symptoms of intestinal obstruction are usually thought of as intestinal colic, vomiting, distension and obstipation. A majority of the cases, however, do not present themselves with this complete picture. Obstipation, for example, is present in less than one-half of the cases and abdominal distension is not often noted by the patient. In the typical case, the diagnosis is made with little difficulty, but unfortunately typical cases are in the minority.

Intestinal colic has been considered the sine qua non for a diagnosis of mechanical obstruction. The association of intermittent cramp-like abdominal pain with audible intestinal noises, or borborygmus, is a consequence of

the altered physiological activity of the intestinal tract. The pain is due to the increased severity of peristaltic action forcing intestinal contents consisting of fluid and gas against a barrier within.

These findings may be summarized as follows: (1) True intestinal colic is always present in mechanical obstruction of the bowel unless fatigue has occurred as a result of prolonged over-

CHART 4

SYMPTOMS IN 104 CASES OF INTESTINAL OBSTRUCTION

	Small Intestinal Obstruction (excl. hernia) 39 cases				*Large Intestinal Obstruction (excl. hernia)* 19 cases				*Paralytic Ileus* 12 cases				*TOTAL (excl. hernia)* 70 cases				*Strangulated Hernia* 34 cases				*TOTAL All Cases* 104			
	Lived	*Died*	*Tot.*	*%*	*Lived*	*Died*	*Tot.*	*%*	*Lived*	*Died*	*Tot.*	*%*	*Lived*	*Died*	*Tot.*	*%*	*Lived*	*Died*	*Tot.*	*%*	*Lived*	*Died*	*Tot.*	*%*
Abdominal pain	17	18	35	89.8	7	12	19	100.0	3	4	7	58.3	27	34	61	87.1	25	5	30	88.3	44	37	91	87.5
Vomiting (non-fecal)	11	9	20	51.3	5	5	10	52.6	2	6	8	66.6	18	20	38	54.3	18	1	19	55.9	36	21	57	54.8
Distension	4	6	10	25.6	5	7	12	63.2	2	8	10	83.3	11	21	32	45.7	5	1	6	17.7	16	22	38	36.5
Obstipation	11	7	18	46.2	4	9	13	68.4	1	3	4	33.3	16	19	35	50.0	2	0	2	5.9	18	19	37	35.6
Fecal Vomiting	2	5	7	17.9	0	5	5	26.8	1	2	3	25.0	3	12	15	21.4	0	1	1	2.9	3	13	16	15.4
Diarrhea	2	1	3	7.7	0	0	0	0.0	0	1	1	8.3	2	2	4	5.7	0	0	0	0.0	2	2	4	3.8
Bloody stool	0	1	1	2.6	1	0	1	5.6	0	0	0	0.0	1	1	2	2.9	0	1	1	2.9	1	2	3	2.9
Pus in stool	0	0	0	0.0	0	0	0	0.0	0	0	0	0.0	1	1	2	2.9	0	1	1	2.9	0	1	1	1.0
Hiccough	1	1	2	5.1	0	0	0	0.0	0	0	0	0.0	0	0	0	0.0	1	0	1	2.9	2	1	3	2.9
Dyspnea	0	0	0	0.0	0	0	0	0.0	0	0	0	0.0	0	0	0	0.0	1	0	1	2.9	1	0	1	1.0

a distended gut. In our series every case of obstruction of the large bowel presented intestinal colic. This symptom was also present in 89.7 per cent of the cases of mechanical obstruction of the small bowel. In four cases (10.3 per cent) of this group no history of colic was elicited. The absence of colic in these cases is difficult to explain. It is possible that because of the severe distension, peristalsis had become inhibited as a result of the fatigue of the intestinal musculature. This phenomenon has been demonstrated experimentally by Sperling[5]. In paralytic ileus abdominal pain was frequently present (58.3 per cent), but was only rarely cramp-like in character. Usually it was indistinguishable from postoperative pain. This is, of course, expected because in ileus there is an increased stimulation of the inhibitory nerves to the bowel which diminish or abolish peristaltic action. With strangulation of an external hernia the common symptom was pain at the site of strangulation. True intestinal colic was present in only 10 cases, or 31.2 per cent, while local pain was present in 20 cases, or 62.4 per cent.

distension. (2) The pain in adynamic ileus is rarely colicky and is often attributed to the associated peritonitis or to the postoperative state when these conditions are present. (3) Local pain at the site of strangulation is more common in a strangulated external hernia in the early stages. If the obstruction persists, intestinal colic develops.

Vomiting is the second most frequent symptom. It occurred in 73, or 70.2 per cent, of the cases in this series. It was noted in all types of obstruction but most commonly in paralytic ileus, occurring in 91.6 per cent of all such cases. The high incidence of severe distension in ileus may have been a contributory factor to the excessive vomiting which was noted.

In obstruction of both colon and small bowel vomiting was frequently noted. The incidence was 79.4 per cent and 69.2 per cent, respectively. While vomiting in small bowel obstruction is expected and easily explained on the basis of the altered physiology, the presence of the ileocecal valve should, theoretically, at least, reduce the incidence of vomiting in large bowel obstruction.

Wangensteen stresses the fact that vomiting is relatively uncommon in these cases because the ileocecal valve tends to make a closed loop of the colon. We have noted, however, that not infrequently the ileocecal valve is incompetent as demonstrated by roentgenological examination following barium enemas and we feel that this accounts for the persistent vomiting which we have so frequently observed in obstructions at the rectum and sigmoid.

Vomiting was noted less frequently in strangulated hernia. This is to be expected, because as a rule the local signs and symptoms bring the patient to operation before late obstructive symptoms have developed.

The occurrence of fecal vomiting was found to be a grave prognostic sign. Sixteen patients had fecal vomiting on admission to the hospital and of these 13 died. No other single sign or symptom was associated so definitely with a fatal termination. Fecal vomiting was noted in five patients with obstruction of the colon; the mortality rate in these cases was 100 per cent. The presence of fecal material in the vomitus usually indicated that the obstruction was complete and had been present for a considerable time. As a rule immediate operative relief of the obstruction is imperative in these cases.

Distension was noted as a symptom in 36.5 per cent of our cases. There was surprisingly little correlation between the existence of palpable or x-ray evidence of distension and the patient's complaint. Many patients who showed physical and x-ray evidence of distension did not even complain of "fullness," while in some of those who complained, confirmatory evidence of distension was lacking. Distension may be an important localizing symptom in diagnosing the site of obstruction. It was noted by 63.3 per cent of the patients with obstruction of the large bowel and by only 25.6 per cent of the patients in whom the small intestine was obstructed.

Obstipation, which is usually stressed as an important symptom of intestinal obstruction, was present in only 35.6 per cent of our cases. In incomplete obstruction obstipation is rarely present, and in the complete forms it is noted only after thorough emptying of the bowel below the site of obstruction has occurred. We have observed regular bowel movements in patients in whom an adhesive band had caused gangrene of the intestine. In obstructions at the rectum or sigmoid obstipation should be more frequently encountered and in our series this was confirmed. In colonic obstructions, 68.4 per cent of the patients complained of complete obstipation, while in small bowel obstruction only 46.2 per cent of the patients noted this symptom. In strangulated hernia obstipation was relatively infrequent (5.9 per cent) because the cases in this group were, as a rule, treated at an earlier stage of the obstructive process.

We wish to stress the fallacy of depending on the presence or absence of bowel movements as a guide to the progress of a patient with obstruction. We have found x-ray examination of far greater value and we believe that the presence of gas in the colon after evacuating enemas and a measureable decrease in the size of the distended loops is a far better index of the state of obstruction than obstipation.

Other interesting symptoms occasionally noted were: diarrhea, four cases; bloody stool, three cases (carcinoma of the rectum, mesenteric thrombosis, strangulated hernia) and dyspnea, one case (diaphragmatic hernia).

PHYSICAL EXAMINATION

Physical examination is most satisfactory in the diagnosis of obstruction due to external strangulation. In every case of strangulated external hernia in the present series, the presence of a palpable, tense, and usually tender mass

at the site of strangulation immediately suggested the correct diagnosis. Occasionally, in the late cases discoloration of the skin was noted over the mass. In the delayed cases, distension, tympanites, ness is not an exclusive feature of the strangulating type of obstruction, for several cases with simple adhesive obstruction showed definite localized tenderness. The absence of tenderness, on

CHART 5A

PHYSICAL SIGNS IN ALL CASES EXCEPT STRANGULATED HERNIA

	Small Bowel Obstruction 39 cases				*Large Bowel Obstruction 19 cases*				*Paralytic Ileus 12 cases*				*TOTAL 70 cases*			
	Lived	*Died*	*Total*	*%*	*Lived*	*Died*	*Total*	*%*	*Lived*	*Died*	*Total*	*%*	*Lived*	*Died*	*Total*	*%*
Distension	12	17	29	74.4	4	10	14	73.7	3	9	12	100.0	19	36	55	78.5
Abdominal tenderness	11	10	21	53.9	2	6	8	42.1	2	2	4	33.3	15	18	33	47.1
Elevated temperature, rapid pulse or dehydration	2	6	8	20.5	1	4	5	26.3	2	7	9	75.0	5	17	22	31.7
Abdominal rigidity	3	5	8	20.5	2	1	3	15.8					5	6	11	15.7
Visible or palpable peristalsis	4	1	5	12.8	1	3	4	21.1					5	4	9	12.8
Mass	1	2	3	7.7	1	4	5	26.3					2	6	8	11.4
Rectal mass					1	1	2	10.5					1	1	2	2.8

abdominal rigidity and general toxic signs appeared. It is fortunate, from the standpoint of therapy, that the local signs of incarceration appear before strangulation has supervened.

In the remaining cases the signs most frequently noted, in the order of their frequency, were distension, abdominal tenderness, rigidity, visible peristalsis and an abdominal mass.

Distension occurred in every case of paralytic ileus. It was usually the earliest and the most pronounced sign. It was also the most frequent sign in all other types of obstruction in this group of 70 cases, being present in 29 or 74.3 per cent of small bowel cases and in 14 or 73.7 per cent of large bowel cases. It is to be noted that the actual presence of distension bears little relation to the presence of the subjective complaint. The extent of the distension was dependent on the duration of the obstruction rather than on the type of obstruction. Altogether 55 or 78.5 per cent of the 70 cases showed distension. Abdominal tenderness occurred in 33 or 47.1 per cent of cases. We have repeatedly observed that localized tender-

the other hand, does not rule out the possibility of strangulation. Muscular rigidity was observed most commonly in conjunction with peritonitis and was of grave prognostic significance. Occasionally in the presence of marked distension, as in adynamic ileus, rigidity was not noted on physical examination.

The existence of visible or palpable peristaltic waves occurred only in late cases. It was observed more frequently in obstruction of the small bowel than in obstruction of the colon and was not noted in any case of paralytic ileus.

The presence of dehydration, associated with elevated temperature, rapid pulse, and other signs of toxemia, was observed fairly frequently (22 cases or 31.7 per cent). These findings occurred in nine cases (75 per cent) of paralytic ileus, all of which were associated with peritonitis. In the other 13 cases, frank perforation of the bowel, local peritonitis, or greatly impaired viability of the bowel without necrosis were apparently the exciting causes of the toxemia.

Occasionally a mass was noted on abdominal or rectal examination, but this

was usually of little aid in establishing the diagnosis.

DIAGNOSIS

The diagnosis of intestinal obstruction is made by a careful study of the history, the physical findings, and the aid. Our greatest difficulty in making the diagnosis has occurred in cases of early postoperative obstruction due to adhesive bands. The onset of obstruction in these cases is usually within one to three weeks after operation, and we have found it to occur most frequently after operation for acute appendicitis or appendiceal abscess. With conditions of this nature one is often misled into attributing the distension, pain and vomiting to a local or diffuse peritonitis. Conservative decompression therapy is then usually instituted with disastrous results unless the true condition is soon recognized. In two cases in this series the diagnosis was missed and both patients died as a result of gangrene of the bowel due to a constricting band. The presence of intestinal colic as differentiated from the usual postoperative pain should aid in making the correct diagnosis, but the most important point is the realization that mechanical obstruction by adhesive bands can occur very early in the postoperative state. As with many other conditions, if one thinks of the possibility, one will make the diagnosis.

CHART 5B

PHYSICAL SIGNS IN CASES OF STRANGULATED HERNIA

34 Cases of Strangulated Hernia

Physical Signs	*Number*	*Per Cent*	*Lived*	*Died*
Palpable mass	31	91.2	26	5
Tenderness	27	79.5	22	5
Distension	10	29.4	8	2
Discoloration of skin over mass	5	14.7	4	1
Rigidity	5	14.7	2	3
Tympanites	3	8.8	2	1
Rapid pulse	3	8.8	2	1
Fever	2	5.9	1	1
Dehydration	1	2.9	1	0

x-ray films. The presence of fluid levels in the intestinal loops on the x-ray film is confirmatory and almost conclusive evidence of obstruction. Films should be taken with the patient in the lateral and supine positions. With the help of these studies the surgeon must be able to accomplish three things in order to institute the proper type of therapy: (1) determine the presence of obstruction; (2) determine the nature of the obstruction, i.e., whether simple or strangulating, and (3) determine the site of the obstruction. Without knowledge of these factors treatment can be only haphazard and is doomed to failure.

1. *Determining the Presence of Obstruction.* A history of recurring episodes of cramp-like abdominal pain associated with the synchronous appearance of audible intestinal noises or borborygmus is essential for a diagnosis of mechanical intestinal obstruction. In the absence of intestinal colic, it is extremely doubtful whether mechanical obstruction exists. Vomiting and distension, as previously noted, are often absent and may not appear until the later stages. Obstipation is unreliable as a diagnostic

The importance of repeated roentgen examinations must be stressed as an aid in diagnosis. In addition, this often enables one to estimate whether the obstruction is complete or incomplete. If the bowel below the site of obstruction is emptied by enemata and demonstrated

to be free of gas, the presence of gas in these loops on subsequent x-ray films indicates that the obstruction is relenting or is incomplete.

2. *Determining the nature of the obstruction.* Probably the most important factor influencing therapy is the determination of the exact nature of the obstruction, i.e., whether it is simple or strangulating. The latter type tolerates no delay in the operative relief of the strangulating mechanism because of the impairment of the blood supply. The differentiation is often fraught with difficulty and occasionally is not possible. The mode of onset, the associated symptoms, and most important, the presence of local signs of peritoneal irritation (tenderness and muscle spasm) are valuable aids in diagnosis. We have found, however, that we have occasionally been misled by the absence of tenderness and muscular rigidity and have treated strangulating obstructions expectantly. We have observed that elevation of the temperature and the pulse rate usually accompanies strangulating obstruction, and in the presence of these signs, we think immediate operation is indicated.

3. *Determining the site of obstruction.* The preoperative localization of the level of obstruction does not present as many difficulties from the clinical point of view as the two previous factors. Inasmuch, however, as the use of conservative therapy is definitely contraindicated in colonic obstruction, this localization must be made with great care. Distension of the abdomen is more common and more marked in large bowel obstructions and vomiting is occasionally less severe. In complete, low obstructions, obstipation is a common symptom. Again, the use of repeated x-ray examination is of inestimable value. The localization of intestinal segments can frequently be made on the x-ray films, and in large bowel obstructions very marked distension of the colon may be noted in the absence of distended small intestinal coils. In obstruction of the small bowel, the colon can be emptied of gas by evacuating enemas and this is readily verified by x-ray examination.

In simple obstructions of the small bowel the exact location of the obstructing mechanism can be determined frequently by using the Miller-Abbot double lumen tube. After preliminary decompression, a thin barium mixture is injected through the tube and "spot" films are taken. These enable one not only to localize the obstruction but frequently to determine the exact nature of the etiological agent. This procedure is not without danger, however, and should not be attempted unless complete facilities for immediate laparotomy are available.

TREATMENT

The treatment of intestinal obstruction is determined by two factors: (1) the location of the obstruction, and (2) the etiological factor. For this reason we have divided the discussion of treatment into its component parts. It is obvious that a thorough understanding of the fundamental physiological alterations is essential to the proper institution and evaluation of any method of treatment. The importance of the distension factor is stressed repeatedly, and this, plus the time factor, must dominate any consideration of a plan of treatment.

1. *Mechanical Obstruction of the Small Intestine.* Mechanical obstruction of the small intestine may be either simple or strangulating. In the latter type, immediate operation is essential if the mortality rate is to be kept at a low level. The mortality rate in strangulating obstructions is determined by two factors: (1) the length of time between the onset of strangulation and the operative relief of the strangulating mechanism, and (2) the nature of the surgical attack. It is axiomatic that the surgical

procedure must be as simple as possible consistent with relieving the strangulation and preserving the viability of the bowel. Excessive manipulation of segments of bowel already damaged by impairment of the circulation almost invariably leads to contamination of the peritoneal cavity by the contents of the obstructed loop, with the expected disastrous sequelae. The nature of the operative procedure in this type of obstruction will be discussed below.

CHART 6

OPERATIONS FOR RELIEF OF INTESTINAL OBSTRUCTION

Nature of operation	*Cases*			*Mortality*
	Lived	*Died*	*Total*	*(Per cent)*
Division of adhesive band	10	2	12	16.6
Division of strangulating ring	27	2	29	6.9
Resection of gangrenous loop of bowel	1	4	5	80.0
Exteriorization of gangrenous loop plus enterostomy	1	1	2	50.0
Closure of perforation and side to side anastamosis	1	3	4	75.0
Enterostomy	3	15	18	83.3
Cecostomy	5	6	11	55.5
Sigmoid Colostomy	3	1	4	25.0
Reduction of eventrated loop of bowel	1	1	2	50.0
Reduction of volvulus	1	1	2	50.0
Reduction of intussusception	1	1	2	50.0
Drainage of peritonitis	1	1	2	50.0
TOTAL	55	38	93	(Av.)40.8

In simple obstruction, relief of the concomitant distension is the principal factor influencing therapy, and the elimination of this factor obviates the need for urgency in undertaking surgical relief of the obstructing mechanism. As long as the blood supply to the bowel is unimpaired and distension is controlled, simple obstruction is compatible with life for a considerable period of time. There are, however, two factors which frequently interfere with the realization of this ideal condition in actual clinical practice.

In the first place, the difficulty of definitely differentiating the simple from the strangulating type of obstruction presents a formidable obstacle to the long continued use of conservative measures. Secondly, there is the ever present possibility that a simple obstruction may change to a strangulating one because of interference with the blood supply, either by an increase in tension of the constricting band, or by pressure on the mesenteric vessels by a kinked and heavy loop of bowel. While it is possible that the obstruction may relent if distension is controlled, and this has been emphasized by some authors, in our experience the possibility of strangulation is the more common of the two.

The advantages of continuous duodenal suction as a mode of therapy in intestinal obstruction are apparent. The elimination of operative intervention in certain cases is a result which must certainly tend to lower the mortality of intestinal obstruction and, even in cases requiring subsequent operation, the beneficial effect of suction in decompressing the bowel is no mean aid to the surgeon in accomplishing the required procedure with a minimum of danger. In order to utilize the advantages afforded by suction and yet guard against the untoward results of its injudicious use, certain criteria must be established. First, suction should be used only in cases of simple obstruction (and paralytic or adynamic ileus) of the small intestine. Secondly, the criteria of successful decompression, as offered by Wangensteen, must be applied to each case. These are: (1) de-

CHART 7

SUMMARY OF NONOPERATIVE CASES

Patient	*Site of obstruction*	*Etiology*	*Treatment*	*Result*
C.S. 68707	Ileum	Adhesive band, early post-operative	Suction	Died (Gangrenous loop of bowel)
A.B. 60494	Ileum	Adhesive band, early post-operative	Suction	Died (Gangrenous loop of bowel)
M.W. 60587	Small Bowel	Adhesive obstruction	Suction	Recovered
J.A. 63709	Small Bowel (Ileum)	Adenomatous polyp causing kink of bowel	Suction	Died 14 hrs. after admission
M.S. 61164	Terminal Ileum	Probably adhesive band	Suction	Recovered
J.C. 63316	Splenic Flexure of Colon	Carcinoma	Suction and rectal irrigations	Died (Metastatic carcinoma)
E.E. 39520	Sigmoid	Carcinoma	Supportive	Died 5 hrs. after admission
J.K. 39068	Rectum	Carcinoma	Supportive	Died (heart failure) day of admission
W.H. 14798	Small Bowel	Adynamic ileus (peritonitis)	Suction Pitressin	Died
M.C. 8636	Small Bowel	Adynamic ileus (peritonitis)	Suction Pitressin	Recovered
A.L. 68748	Small Bowel	Adynamic ileus (postpartum peritonitis)	Suction Pitressin	Died

crease in the severity of the colic; (2) decrease in the distension; (3) the presence of gas in the colon after an evacuating enema as evidenced by repeated x-ray films; (4) withdrawal of smaller amounts of fluid by the duodenal tube; and (5) toleration by the patient of a temporary discontinuance of the suction. In addition the general condition of the patient must be observed closely. In our cases, a rise of pulse rate and temperature usually presaged an unfavorable outcome. The use of any single criterion is dangerous and misleading as many patients will be relieved of pain and will exhibit a decrease in the distension while gangrene of the bowel is advancing. The most careful observation is essential and the necessity for frequent x-ray examination of the abdomen cannot be overstressed. In spite of this, as the following survey illustrates, strangulation may supervene and lead to a fatal outcome.

Continuous duodenal suction by the Wangensteen method was used either as a preliminary method of treatment, or throughout the entire course, in 26 cases, or in 50.9 per cent of all cases of obstruction involving the small intestine, excluding strangulated hernia. Of these, 16 patients had mechanical obstruction and 10 were suffering from adynamic ileus as a sequela of peritonitis. Of the former group, 12 cases or 75 per cent subsequently came to operation because of lack of improvement. Operation in four cases consisted of simple division of an adhesive band which was performed without mortality. In six cases ileostomy was performed with a mortality of 83.3 per cent (five cases). At the time of operation, in three of these cases perforation of the bowel had

already occurred, indicating that conservative treatment either had been ill-advised, or had been persisted in too long. Of the remaining two cases, a side-to-side anastomosis was performed in one case with a successful outcome, and a reduction of an eventrated, kinked loop of bowel was undertaken in the other with ensuing mortality. Four cases of mechanical obstruction were treated by suction throughout their course. In two, the obstruction relented and the patients were discharged as cured. In the other two cases, a fatal termination occurred, and postmortem examination revealed gangrene of the bowel caused by an adhesive band. In neither case did the clinical course indicate impending or actual gangrene, and, as a matter of fact, both patients showed clinical improvement until the day before death. These cases illustrate again the necessity for proper selection of cases for conservative treatment, the difficulty of differentiating simple from strangulating obstructions, and the need for most careful observation to determine at what point the efficacy of suction has begun to diminish.

It is apparent from the foregoing survey that time is one of the dominating elements in the successful treatment of intestinal obstruction. Despite the most careful observation, the sequence of events in a simple obstruction may lead to a fatal conclusion, without exhibiting warning symptoms and signs. Yet, because of the definite advantages inherent in the use of continuous suction, one cannot deny the patient the benefits of its use. By careful control of the time factor, one may, however, correlate these diverging indications and formulate a routine of therapy. In dealing with a simple obstruction, suction may be instituted at the onset. If improvement is not obvious, as manifested by all the criteria previously listed, in 36 hours operation should be undertaken. In our series only one patient in whom operation was undertaken after preliminary treatment with continuous suction for more than two days survived. This indicated that the change from simple to strangulating obstruction may occur quickly and that delay beyond a certain point is fatal.

With the introduction of the Miller-Abbott tube for continuous intestinal suction, certain aspects of the problem of therapy changed. One of the disadvantages of the Wangensteen method of continuous suction is that the force of suction is exerted at a distance from the site of obstruction, and this force may be interfered with by changing relationships of the gas and fluid content of the bowel and by kinks or angulations in the bowel. With the application of suction at the point of obstruction by the use of the Miller-Abbott tube, this disadvantage is overcome and what is essentially a nonsurgical enterostomy is effected. This, in itself, is a definite advantage, the mortality rate following surgical enterostomy being as high as it is in most hands. However, the time element again assumes a dominant position in connection with the use of this modified form of suction. In our experience the delay in passing the Miller-Abbott tube to the point of obstruction outweighs the advantages of direct application of suction. We have also noted that adequate relief of the distension cannot be accomplished until the tube is well past the second portion of the duodenum, a procedure which often requires 24 hours. One other advantage claimed for the Miller-Abbott tube, namely, that it enables one to use the intestinal canal above the site of the obstruction for nutritive purposes, we largely discount. We have been able in our cases to supply the principal nutritive elements and keep our patients in salt and water balance by intravenous therapy and we should greatly hesitate to introduce food into an obstructed bowel.

In a series of 15 cases treated subsequent to January 1, 1938, suction through a Miller-Abbott tube was attempted. We were able to intubate the patient successfully in only seven cases. In the remaining eight cases we were either unable to wait until the tube passed the pylorous because of the urgency of the symptoms, or were unable to get the tube to pass. Of our seven successful cases only one, a case of volvulus of the small bowel, came to operation. We have found the Miller-Abbott tube to be most valuable in the treatment of paralytic ileus or early postoperative adhesions, particularly when the obstruction is incomplete. In our hands it has been of little or no value in complete mechanical obstructions. We feel that with continued experience in the use of the Miller-Abbott tube we should be able to improve these results, but it is essential that greater caution be used in the proper selection of cases[13].

2. *Paralytic Ileus (Adynamic or Inhibition Ileus).* The treatment of adynamic ileus is far from satisfactory as the mortality records in most hospitals will show. In the 12 cases of paralytic ileus which we have presented, only 3 patients survived. We feel that the principal factor contributing to this excessive mortality was the free use of enterostomy as a therapeutic measure. Many of these cases were treated before the publication of Wangensteen's work on continuous suction and would undoubtedly be treated differently today. Modified duodenal suction was instituted in 10 cases of paralytic ileus, of which 9 were due to peritonitis. In one case improvement was obtained and the patient survived, while two other patients died as a result of the associated peritonitis. In the remaining seven cases, enterostomy was performed after a period of from two to seven days with a mortality of 85 per cent (6 cases). These figures represent more of an indictment against surgery than against conservative treatment. We feel today that suction offers a better opportunity for survival than enterostomy in adynamic ileus, and believe that in our cases operation was undertaken mistakenly in the hope that apparently hopelessly ill patients might have a better chance to survive. Colp[14], Van Buren and Smith[15], Wangensteen[16], Morton[17], and others confirm the impression that enterostomy is of little or no value in adynamic ileus. Our recent experience in cases not included in the present series also confirms this impression and we feel that continuous suction is the treatment of choice. In spite of some enthusiastic reports on the use of prostigmine and physostigmine[18] we have not been able to obtain consistently good results with these drugs. The seriousness of the exciting cause has mitigated against the favorable outcome in most of the cases in this group, but the relief of distension by means of continuous suction should certainly be a valuable adjunct in treating the peritonitis which is so frequently encountered as a causative agent in adynamic ileus.

3. *Obstructions of the large bowel.* Mechanical obstruction of the colon resembles, in many respects, a strangulating or a closed loop obstruction. The competency of the ileocecal valve in a majority of these cases causes the bowel to become tremendously distended and perforations of the bowel wall occur because of interference with the blood supply. As might be expected, suction is of no aid in the treatment of colonic obstruction. Theoretically it might be possible to introduce the Miller-Abbott tube through the ileocecal valve, but the necessary delay might well be disastrous. The procedure of choice is undoubtedly cecostomy. This serves the dual purpose of providing immediate decompression in the acute stage and of acting as a colostomy during subsequent operative procedures which may be necessary in

dealing with carcinomas of the sigmoid and rectum which are the usual obstructing agents. While a transverse colostomy (Devine) may be desirable in many cases, it is rarely feasible in acute obstruction. In 21 cases of obstruction of the large bowel (including strangulated hernia) colostomy was performed 15 times with ensuing mortality in 7 cases (53.9 per cent). In 11 of these cases cecostomy was performed with a mortality of 55.5 per cent (6 cases), while in 4 cases sigmoidostomy was performed. In these cases a double-barrelled colostomy was made, three times because of carcinoma of the rectum and once for stricture of the rectum due to lymphogranuloma inguinale. Only one patient in this group died, a patient who had had an obstruction for two weeks.

OPERATIONS FOR INTESTINAL OBSTRUCTION

The dangers of operative procedure on a damaged segment of bowel are well known. The release of a band or of a strangulated hernia is attended with little danger if the bowel is still viable. When necrosis has occurred the danger increases by leaps and bounds. Even the handling of a nonviable loop of bowel may initiate peritonitis, and entering into the lumen of the bowel for the performance of enterostomy or resection is extremely hazardous.

As a rule, the simplest procedure and the one involving the least handling of intestine is the procedure of choice. This is so well recognized that in obstructions of the colon many surgeons do a simple cecostomy without attempting to explore the abdomen, reserving this maneuver for the secondary operation. Similarly, in small bowel obstruction, manipulation of bowel while dividing adhesive bands not uncommonly causes perforations and gross leakage of infected bowel contents into the peritoneal cavity. In at least two cases in our series this accident occurred and resulted in a fatal peritonitis. With proper diagnosis and early treatment, the need for enterostomy should largely be eliminated and operative treatment then falls into three categories: (1) simple division of obstructing bands or strangulating rings; (2) procedures for dealing with gangrenous intestine, and (3) cecostomy for obstruction of the colon.

1. *Division of Constricting Bands or Strangulating Rings.* This procedure is almost invariably the choice in the early operative treatment of simple obstructions and strangulated hernia. With viable bowel and a minimum of handling there should be practically no mortality. This procedure was carried out in 12 cases of adhesive obstruction of the small bowel and in 29 cases of strangulated hernia. There were four mortalities in this group, of which two were due to postoperative pneumonia, one to pulmonary embolus, and one to cardiac failure on the first postoperative day. In all, 36 patients survived, a mortality rate of 9.7 per cent. This illustrates the points previously stressed, that early diagnosis and early operation will bring the mortality rate in intestinal obstruction down to a reasonable figure. Excluding the cases of strangulated hernia, there were two mortalities in 12 cases of simple obstruction or 16.6 per cent. One of these was in a patient of 80 years who developed hypostatic pneumonia on the tenth postoperative day when she had almost completely recovered from the effects of the operation. The other mortality resulted from bilateral bronchopneumonia on the seventh postoperative day. These figures illustrate more vividly than any lengthy discussion the importance of early diagnosis and treatment and the necessity of restricting operations to the simplest procedures if at all feasible.

2. *Procedure for Gangrenous Segments of Bowel.* When gangrene of the bowel has occurred, it is necessary to remove the gangrenous loop of bowel

from the peritoneal cavity. This may be done by one of three methods: (1) primary resection of the involved loop; (2) exteriorization of the loop; (3) attempts to close or invert a necrotic perforation in the bowel. We mention the last only to condemn it thoroughly. Primary resection carries with it a tremendous risk and this is especially true in the poor risk patients suffering from intestinal obstruction. In five cases of our entire series a primary resection was undertaken for gangrenous bowel. The etiological factor in two cases was strangulated hernia, in one case adhesive obstruction, in one case volvulus, and in one case, mesenteric thrombosis. Of these, four patients died (80 per cent), three from peritonitis and one from coronary disease. Although it is conceded that these patients were desperately ill, it is for this reason that we believe exteriorization should have been done. In two other cases, the gangrenous loop was exteriorized and enterostomy performed, and one of these patients (etiology: volvulus) died, a mortality of 50 per cent. In four cases the perforation was closed and a short-circuiting side-to-side intestinal anastomosis was performed with a mortality of three cases (75 per cent). In all, in eleven patients a surgical procedure of great magnitude was undertaken in order to deal with gangrene of the bowel, with a mortality of eight cases, or 72.7 per cent. A thorough study of these cases convinces us that exteriorization of the involved loop would have materially lowered our mortality rates. All of these patients, with one exception, died of peritonitis, and while it is possible that the contamination of the peritoneal cavity had occurred at the time of operation, it is likewise conceivable that excessive operative manipulation, no matter how skillfully performed, increases the dangers of peritonitis when necrosis of the bowel wall is present.

3. *Cecostomy and Enterostomy.* While cecostomy is a desirable procedure and a life saving measure in colonic obstructions, the same cannot be said for enterostomy in small bowel obstruction. Enterostomy is usually undertaken as a last desperate measure after conservative methods of treatment have failed, or when the viability of the bowel seems to be impaired at the time of operation. Occasionally, an enterostomy tube is placed into a small perforation in the intestine, a procedure usually carrying with it a 100 per cent mortality. The types of enterostomy most frequently employed were the Witzel or Stamm methods. These offer sufficient drainage and close promptly following removal of the tube.

Enterostomy alone was performed in 18 cases in our entire series. These cases were divided as follows: paralytic ileus, seven cases; adhesive obstruction, eight cases; obturating obstructions (gallstones), three cases. Fifteen of these patients died (83.3 per cent). This represents the highest mortality of any procedure carried out on our entire series. We feel that enterostomy is never indicated in paralytic ileus and only is indicated in cases of small intestinal mechanical obstruction in which it is not possible to pass the Miller-Abbott tube which acts as a nonsurgical enterostomy. If, at the time of operation, necrosis of the bowel wall is present, the period of usefulness of enterostomy has passed, except insofar as it is combined with other procedures, such as resection. Probably the only real indication for enterostomy is its use to reduce tension on a suture line or occasionally for feeding.

Cecostomy, on the other hand, is eminently successful in the treatment of obstructions of the large bowel. It is often possible to perform this aseptically and peritonitis results less frequently than with enterostomy. We have employed the purse string suture method with a Pezzer catheter as the

method of choice in our cases. Although the mortality rate was very high in our group of eleven cases (55.5 per cent), this is in part accounted for by the fact that the average duration of obstruction preceding operation was nine days in the fatal cases. In the patients who survived, the average duration of obstruction was four and one-half days. Occasionally it is possible to perform a sigmoid colostomy in cases of obstruction due to carcinoma of the rectum. This may occur in early cases before terrific distension of the bowel has occurred with consequent thinning of the bowel and possible gangrene. When it is feasible, it is usually accompanied by a low mortality rate. In four cases operated on by this method there was one mortality (25 per cent).

ADJUNCTS TO TREATMENT

Inasmuch as all patients with intestinal obstruction are seriously ill, the details of general surgical care assume a rôle of great importance. The management of fluid and electrolyte balance, transfusions, nutrition, and the prevention of pulmonary complications are problems which are vital to a favorable outcome. It is well recognized today that although sodium chloride has no specificity in the treatment of high obstructions, it is nevertheless essential when the loss of chlorides has been marked. Control of the water balance is urgent because of the marked dehydration caused by vomiting. It is safe to assume that these patients have lost at least the six per cent of body weight in fluids that Coller and Maddock[19] have determined to be the average in severe dehydration. This amount must be made up at once, and in the average patient the administration of 3,000 to 4,000 cc. of fluid will be indicated. Furthermore, if treatment by suction is instituted, and no fluid is retained by mouth, a daily amount of fluid which will balance the loss due to suction, excretion of urine, and insensible loss through skin and lungs is indicated. This usually amounts to 3,500 or 4,000 cc. daily; if this schedule is adhered to, dehydration will not occur.

Preservation of the salt and protein balance is another problem facing the surgeon. Undoubtedly electrolytes are lost in large amounts in persistent vomiting and estimation of the serum chlorides will indicate the extent of this loss. As a rule, the higher the obstruction in the intestinal tract, the greater the chloride loss. When this loss is marked, it can be rectified by the administration of hypertonic saline solution, although the use of normal saline or Ringer's solution is probably safer. The amount of saline to be administered can be estimated readily by the formula proposed by Bartlett and his coworkers[20]. This formula is: For each 100 mg. that the plasma chloride level needs to be raised to reach the normal, the patient should be given 0.5 gm. of salt per kilogram of body weight. The dangers of excessive salt intake in a seriously sick patient are well known, and it is therefore advisable to check the plasma chlorides repeatedly until normal levels have been reached. A slight excess of the calculated amount of sodium chloride to restore the plasma chlorides to normal may, however, be given without danger. Associated with the loss of chlorides, changes in the serum protein values are frequently noted. Occasionally, in long standing illnesses preceding the onset of acute obstruction the protiens may be depleted, but more commonly, because of the extensive dehydration, the values for the serum proteins are increased. This may be misleading because when the water balance is restored, the value for the serum proteins may be found to be lowered to the pre-edema or edema levels. If salt has been given to excess, edema may then occur and may seriously interfere with the postoperative course. When the

serum proteins are actually depleted, they may be restored by transfusions of plasma or whole blood[21]. When they are elevated as a result of hemoconcentration following excessive water loss, the restoration of the normal water balance will effectively restore them to a proper level.

Blood transfusion is frequently an important adjuvant to treatment. In strangulating obstructions, the total blood loss into the lumen of the bowel and the peritoneal cavity may be very severe. This must be immediately replaced by large and often multiple transfusions. In addtion, shock which is frequently associated with intestinal obstruction is best treated by blood transfusions. As a preliminary to operative intervention, transfusions are particularly valuable and may be life saving in cases in which surgical intervention is extensive.

In our experience the use of drugs to stimulate peristalsis has been disappointing. It is obvious, of course, that their use is contraindicated in mechanical and strangulating obstructions. In adynamic ileus we have rarely been successful in alleviating the distension by the use of pitressin, physostigmine or prostigmine. There may be some advantage in the use of these drugs in the immediate postoperative period to prevent abdominal distension, but we feel that they are of little or no value in the treatment of advanced adynamic ileus. Spinal anesthesia has not been used in this series of cases as a mode of therapy and we hesitate to recommend it.

A word must be said about adequate vitamin intake. In all patients suffering from disturbances in the gastrointestinal tract, the absorption and utilization of vitamins is diminished.[21,22] This may seriously interfere with the postoperative course and with wound healing. In patients who have had restriced dietary intake and in whom suction has been used for many days, vitamin C should be administered parenterally.

The routine use of suction in the postoperative state should be emphasized. After every operative procedure for intestinal obstruction we have instituted continuous duodenal suction. By eliminating distension and relieving the pressure on a compromised loop of bowel or on a suture line, it is of inestimable value.

While the use of oxygen in high concentration was not attempted in this group of cases, it is apparent from the work of Fine and his associates[23] that it is of definite value and is certainly indicated in the conservative treatment of intestinal obstruction.

MORTALITY

The mortality rate in intestinal obstruction is very high. In our entire series, 46 patients died, a mortality rate of 44.2 per cent. In four cases, the patients died within a few hours after admission, without having been operated upon. If we exclude these from our series, we have a mortality rate of 42.3 per cent for all cases receiving treatment. Operation was performed in 93 cases with mortalities in 38 of this group, or in 40.8 per cent. In 11 cases, no operation was undertaken and three patients survived, a mortality of 72.7 per cent. However, the four patients who died on admission are included in this group and the revised mortality rate for nonoperative cases would be 57.1 per cent.

Adynamic or paralytic ileus, in our series, proved to be the most serious condition causing intestinal obstruction. Nine patients of the entire group died, a mortality of 75 per cent. In 10 cases, peritonitis was the inciting cause of the ileus and it is conceivable that this accounted in no small measure for the high mortality rate. Strangulated hernia, on the other hand, offered the least grave prognosis. In 34 cases, there were five deaths or 14.7 per cent. In three

patients of this group death was due to coronary disease, pulmonary embolus, and cardiac failure, respectively, and in only one case was resection for gangrenous bowel undertaken. There were 21 fatalities in 39 cases of mechanical obstruction of the small intestine (exclusive of strangulated hernia), or 53.8 per cent, and in 19 cases of obstruction of the colon there were 11 deaths, or 57.8 per cent. This includes three patients who died within six hours of admission to the hospital and who received only supportive treatment. Considering this factor, the mortality in treated cases of obstruction of the large bowel was eight cases, or 42.1 per cent.

There is a definite and consistent relationship between the mortality rate and the time which had elapsed between the onset of obstruction and the relief of the obstructing mechanism. It is obvious from the nature of the physiological disturbances which occur in obstructions that the time factor is of paramount importance. In strangulating obstructions the deleterious effects of the marked blood loss are added to the danger of peritonitis. Chart 8 illustrates the increasing mortality associated with delay in treatment. In 25 cases of strangulated hernia in which the obstruction had been present for less than two days, the mortality rate was 8 per cent, whereas in the nine patients who were operated upon after a delay of more than two days, the mortality rate was 33.3 per cent. Similar findings are noted in the cases of obstruction due to intussusception and volvulus.

CHART 8

DURATION OF OBSTRUCTION AND MORTALITY

Cause of Obstruction	*Less than 24 hours*		*Less than 2 days*		*Less than 4 days*		*Less than 1 week*		*1 week or more*					*Per Cent Died*
	Lived	*Died*	*Lived*	*Died*	*Lived*	*Died*	*Lived*	*Died*	*Lived*	*Died*	*Total*	*Lived*	*Died*	
Adhesive obstruction			4	2	9	4	1	1	3	4	28	17	11	39.3
Gallstone obstruction								3			3	0	3	100.0
Carcinoma		2	1	1	1	1		3	2	3	14	4	10	71.4
Adenomatous polyp						1					1		1	100.0
Lymphogranuloma									1		1	1		0.0
Postoperative eventration							1	1			2	1	1	50.0
Ileitis										1	1		1	100.0
Strangulated hernia	10	1	13	1	3		3	3			34	29	5	14.7
Volvulus	1			1		1		1			4	1	3	75.0
Intussuseption					1					1	2	1	1	50.0
Paralytic ileus		2			2	3	1	4			12		9	75.0
Mesenteric thrombosis		1									1		1	100.0
Cause unknown		1									1		1	100.0
Totals	11	7	18	5	16	10	6	16	6	9	104	58	46	44.2 (Av.)

In simple obstruction the onset of necrosis of the bowel wall is dependent on the distension factor and the element of direct occlusion of the blood supply is not present in the early stages. Therefore, delay in treatment is not so disastrous. We note, however, that in 19 cases of simple adhesive obstruction treated within the first four days of illness there were six deaths, a mortality rate of 31.6 per cent, while in the nine cases in which obstruction had been present for more than four days before treatment was instituted there were five deaths (55.5 per cent).

A survey of the factors causing death in our series showed that peritonitis was the most frequent cause. In 31 or 67.7 per cent of the fatal cases of our entire group, death was definitely attributable

to peritonitis and confirmed by operation or autopsy. In most of these cases, gangrenous or nonviable bowel was present at the time of operation or observation.

CHART 9

CAUSES OF DEATH

Cause of death	*Adynamic ilues*	*Strangulated hernia*	*Small bowel obstruction*	*Large bowel obstruction*	*Total*
Peritonitis	9	2	15	5	31
Cardiac or cardio-pulmonary	0	2	0	4	6
Pneumonia	0	0	3	1	4
Pulmonary emboli	0	1	0	1	2
Shock	0	0	2	0	2
Unknown	0	0	1	0	1
TOTAL	9	5	21	11	46

In a few, peritonitis followed the injudicious use of enterostomy or more extensive operative procedures. Four patients (8.7 per cent) died of pneumonia and 6 (13.1 per cent) died of cardiac or cardiopulmonary diseases. In five cases of our series the cause of death was not definitely known. In two cases, the clinical course strongly suggested pulmonary emboli; in two other cases (one of volvulus and one of mesenteric thrombosis) shock was considered the cause of death and in one case, a patient who died 14 hours after admission, no cause could be definitely stated.

The high incidence of peritonitis as a cause of death is to be expected on the basis of the pathological physiology and pathology of intestinal obstruction. The damage to the bowel wall as a result of distension causes increased permeability to bacteria and peritonitis often ensues without gross perforation of the bowel wall. In many cases bowel necrosis was present at the time of operation and in these patients a fatal outcome was almost inevitable. Nothing in this series lends credence to the toxic theory of death in intestinal obstruction. The sequence of events in most cases and the operation or postmortem findings were too conclusive to permit of speculation as to extraneous factors in the fatal outcome. We feel that in no case did a disturbance of the chlorides lead to death, and although potassium studies as advocated by Scudder and his co-workers[24] were not made, it seems reasonable to believe that altered potassium metabolism, if present, was but one incidental factor.

SUMMARY AND CONCLUSIONS

1. A series of 104 cases of acute intestinal obstruction due to thirteen etiological factors is presented. The incidence of cases in this series conforms closely to other reported series.

2. The pathological changes which occur are directly attributable to the disturbances in the normal physiology of the bowel caused by the obstruction.

3. Distension and impairment of the circulation of the bowel are the principal changes which occur.

4. The symptoms most frequently noted are intestinal colic, vomiting, distension and obstipation.

5. The physical findings commonly encountered are distension, abdominal tenderness and rigidity, and the signs of toxemia.

6. Treatment is based on two factors: (a) the location of the obstruction, and (b) the nature of the obstructing agent.

7. In strangulating obstructions immediate operation is imperative. In simple obstruction of the small bowel relief of the distension may cause the obstruction to relent.

8. Continuous duodenal suction has a definite field of usefulness in the treatment of simple, mechanical obstructions of the small bowel and in adynamic ileus. In the former group great caution must be exercised to determine when suction is no longer efficacious.

9. Operative treatment should be limited to the simplest procedures which will relieve the distension and obstruction and maintain or restore the viability of the bowel. Extensive operative procedures are accompanied by extremely high mortality rates.

10. Enterostomy has been almost completely displaced by the Miller-Abbott tube as a procedure for applying decompressive measures to the site of obstruction. It is never indicated in adynamic ileus.

11. In obstructions of the colon early operation is essential. Cecostomy is the procedure of choice.

12. The general principles of electrolyte, water, protein and vitamin balance must be applied to these seriously ill patients. Blood transfusions are of great value as adjuvants to operative procedures.

13. The employment of drugs to stimulate peristalsis has been valueless in our hands. We feel that the administration of oxygen in high concentrations is of definite value.

14. The mortality rate of intestinal obstruction is still very high. Early diagnosis, immediate operation in strangulating obstructions, the careful use of suction in indicated cases, the elimination of enterostomy except in isolated cases, and careful attention to the general status of the patient will lower the mortality rate.

15. There is a definite relationship between the length of time during which the obstruction has been present and the mortality rate.

16. The most frequent cause of death is peritonitis. Nothing in our series lends credence to the toxic theory of death in intestinal obstruction.

Note: We wish to thank Dr. A. J. Beller and Dr. A. J. Rongy for the privilege of studying cases on their ward and private services. We are also indebted to Dr. M. Goldman for his valuable assistance in the use of the Miller-Abbott tube.

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RÉSUMÉ

Obstruction Intestinale Aiguë

L'auteur rapporte 104 cas d'obstruction intestinale due à treize facteurs etiologiques différents. Les symptômes les plus fréquemment observés furent colique intestinale, vomissements, distention et obstipation. Le clinicien constate la distention et la douleur abdominales, la rigidité du ventre et les symptômes de toxémie. Le traitement est determiné et par le siège et par la nature de l'obstruction. Dans les cas simples d'obstruction de l'intestin grêle, le soulagement de la distention peut remédier à l'obstruction. La suction duodénale continue est utile pour ce but. Dans les cas d'étranglement l'opération est urgente. L'operation doit être précoce dans les obstructions du côlon. Ayez recours aux procédures les plus simples qui puissent remédier à la condition et qui maintiennent ou restaurent la viabilité de l'intestin. Il y a un rapport défini, entre la durée de l'obstruction et la mortalité.

ZUSAMMENFASSUNG

Akuter Darmverschluss

Eine Serie von 104 Fällen von akutem Darmverschluss, die auf 13 verschiedenen Ursachen beruhen, wird veröffentlicht. Die Sypmtome, die am häufigsten beobachtet werden, sind Darmkoliken, Erbrechen, Verstopfung und aufgetriebener Leib. Objektive Symptome, die gewöhnlich gefunden werden, sind, aufgetriebener Leib, Schmerzen, Bauchdeckenspannung und die Zeichen einer Toxämie. Die Art der Behandlung wird beeinflusst durch 1) den Ort, 2) die Natur des Verschlusses. Beim einfachen Dünndarmverschluss kann oft die Beseitigung des aufgetriebenen Leibes das Verschwinden des Ileus verursachen. Daher ist eine dauernde Dünndarmdrainage für diesen Zweck sehr nützlich. Bei einem Strangulationsileus muss eine sofortige Operation vorgenommen werden. Frühzeitige Operation ist notwendig bei einem Dickdarmverschluss. Die Operation soll sich beschränken auf die einfachsten Massnahmen, welche den Zustand beheben und die Lebensfähigkeit des Darmes erhalten, oder wieder herstellen. Es besteht eine ganz ausgesprochene Beziehung zwischen der Dauer des Darmverschlusses und der Mortalität.

SUMARIO

Obstrucción Intestinal Aguda

Una seri de 104 casos de obstrucción intestinal debido á trece factores etiológicos distintos es presentada. Los síntomas mas frecuentemente notados fueron cólico intestinal, vómitos, distención y obstipación. Los signos físicos generalmente encontrados son distensión, dolor abdominal, rigidad muscular y toxemia. El tratamiento está basado (1) en la localización y (2) la naturaleza del agente obstructor. En obstrucciones simples del intestino delgado el alivio de la distensión puede hacer ceder la obstrucción. Drenage duodenal

continuo es beneficioso para obtener éste proposito. En obstruciones por estrangulacion operación inmediata es imperativa. Operacione temprana es esencial en obstruciones del colon. La operación debe de ser limitada al proceder mas simple el cual mejora la condición y ayuda á restaurar la vitalidad del intestino. Hay una relación definida entre la duración de la obstrucción y el por ciento en la mortalidad.

RIASSUNTO

Ostruzione intestinale acuta

Viene presentata una serie di 104 casi di ostruzione intestinale dovuta a 13 fattori etiologici. I sintomi piu frequenti sono: colica intestinale, vomito, distensione, constipazione. I segni fisici che si incontrano usualmente, sono, distensione, dolenzia addominale, rigidità e segni di toxemia. Il trattamento si basa sulla località e la natura dell'agente ostruente. Nell'ostruzione strazzata l'atto operatorio immediato è necessario. Una operazione precoce è essenziale nella ostruzione del colon. L'atto operatorio deve essere limitado alla più semplice tecnica, per alleviare la condizione e mantenere e ristorare la viabilità dell'intestino. Esiste una relazione definitiva tra tempo dell'ostruzione e mortalità.

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THE ARRANGEMENT COMMITTEE

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THE NATIONAL ASSEMBLY OF THE UNITED STATES CHAPTER OF THE INTERNATIONAL COLLEGE OF SURGEONS WILL BE HELD FEBRUARY 11 TO 14, 1940, AT VENICE, FLORIDA, UNDER THE DIRECTION OF INTERNATIONAL PRESIDENT-ELECT DR. FRED H. ALBEE AND THE PRESIDENCY OF DR. FREDERICK M. DOUGLASS.

APPENDICITIS: ITS DIFFERENTIATION AND TREATMENT

REVIEW OF 500 CASES

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UPON request I shall endeavor to give you, as nearly as I can, a composite picture of appendicitis and those conditions arising in the right side of the abdomen that may be confused with it. The subject matter will be based upon knowledge gained from the literature and a personal experience of more than thirty years. If what is said will in any way assist in slowing down the rising mortality in this condition, my time will have been well spent.

Involvement of the appendix is usually the result either of an inflammatory reaction or of a physiological dysfunction resulting from mechanical interference. The latter we designate appendicosis. Both are clinical entities and present a train of distinct diagnostic symptoms.

The United States leads all other countries in deaths from appendicitis. The mortality is 18 for each 100,000 and equals the combined death rate of ectopic pregnancy, pyosalpinx, gall stones, surgical disease of the pancreas, spleen and thyroid. It takes 20,000 of our people annually and is the cause of one death every 26 minutes. When operation is delayed and cathartics and enemata are given in an effort to obtain relief without operation, one in every 11 patients dies. If repeated purgation is practiced before operation, one in every four patients dies. Only one death occurs in every 96 cases if purgation is not practiced. If prompt and proper treatment is given, the mortality in appendicitis should not exceed one in every 240 cases.

It has been my privilege to pass through more than three decades of the appendiceal dilemma. Many years ago death from this disease was attributed to inflammation of the bowel. In those days the question was: "Shall we or shall we not operate in appendicitis?" In the second decade the duration of the attack was the question of paramount importance. The literature now abounds with discussions of the etiology, diagnosis, treatment, and mortality of this disease—mute evidence that the problem is not yet settled in the minds of many. Municipalities are so concerned over the matter that they are publishing facts related to the disease in the lay press and are bringing them to the attention of high school students through lectures and pamphlets. Philadelphia, for example, has made an intensive effort to inform its people of the importance of the early recognition of the condition, of prompt and proper care of the painful abdomen, and of the ever increasing mortality of appendicitis.

Acute appendicitis probably is our oldest and best known surgical disease. The embryology with its many resultant locations is interesting, its anatomy is well known, its etiology complex and its pathogenesis much discussed. Its symptomatology is so constant and so consistent with the degree of involvement of the appendix that it is a pleasure to review it. Pain, followed by nausea, with or without vomiting, tenderness, fever, increase in the pulse rate, and leucocytosis, always in sequence, form the well known Murphy syndrome.

PAIN

In the absence of concomitant disease, pain is the primary and first symptom in acute appendicitis. In 99 per cent of cases the invasion of the appendix by the offending organism begins in the mucosa. As with all inflammatory lesions, the invasion is accompanied by swelling. The inelastic fibrous coat of the appendix prevents expansion and produces strangulation. Pain and colic are the result. The pain is transmitted through the sympathetic nervous system to the cord and through the anterior and lateral cutaneous branches of the peripheral intercostal nerves to the abdominal wall. Later the pain is localized over the appendix because of extension of the involvement through the walls to the serosal coat and of the swelling to the mesoappendix, which carries sensory fibers. The parietal peritoneum usually also is involved by this time, and it is much more sensitive to pain than the visceral peritoneum. We have been taught that in the first few hours of the attack the pain is of a diffuse colicky nature, spreading over the entire abdomen, but it may be epigastric, umbilical, or over the appendix, whatever its location.

In a recent study of 500 consecutive cases of appendicitis without concomitant disease, 67 of which were classified as chronic, we found the pain of the diffuse abdominal type in 168, epigastric in 107, and over McBurney's point in 225.

NAUSEA AND VOMITING

Nausea and vomiting are reflex symptoms — the result of strangulation of the mucosa. As soon as the mucosa begins to swell, the ileocecal valve closes, a reverse peristalsis ensues, and the content of the small bowel is poured into the stomach. The stomach does not tolerate bile unless it has become accustomed to it, and nausea with or without vomiting follows. Vomiting, we think, is of especial importance and has a bearing on the gravity of the attack.

We were once removing the appendix of Dr. J. under local anesthesia. The appendix was normally situated and easily visible after the peritoneum had been opened. We very lightly picked it up with a Russian tissue forceps without pulling on the meso-appendix which we know will produce pain. He laughingly said, "Will you take your fist out of my stomach?" We have since verified this finding on other patients and now believe that, if the involvement of the wall or the distension of the lumen is of sufficient degree, in all cases vomiting will follow the nausea. In fact, practically all cases of appendicitis we operate on show advanced pathology when vomiting has been present. It is just a little point, but the little points are the ones that get us into the two per cent division. Ninety-eight per cent of the time we will be right any way.

Three hundred sixty of our aforementioned 500 cases had nausea, and 235 had vomiting. Sufficient pressure from within the lumen will give a complaint like that due to changes in the walls; and the earlier we can get the appendix out in a case in which vomiting is present, the better we like it. Nature is a wonderful doctor. She knows an empty bowel at rest is an ideal situation in cases of this kind; and until something happens to check her efforts, vomiting will continue.

AGE, FAMILY HISTORY, NUMBER OF ATTACKS

Some of us pay little attention to the age incidence. Nevertheless it has its importance. Appendicitis is far more fulminating in the very young or aged than when seen between the second and third decades of life. In the aged symptoms are often atypical and rupture occurs without the usual warning.

The family history in this disease also is of importance. Appendicitis is

familial. We have removed the appendix of four in one immediate family, and out of eight members in this family five have had their appendices removed and one has had two attacks.

While to a lesser degree the number of attacks have a place in determining the desirability of operation, the point should not be overlooked. It is more difficult for an appendix showing scar tissue, the result of previous inflammation, to weather the onslaught than a normal one.

TENDERNESS

Tenderness, rigidity, and muscular spasm are our most valuable guides in determining the degree of involvement of an affected part. The more extensive the infiltration of the walls of the appendix, or the greater the distention of the lumen, the more pronounced the tenderness, rigidity, and the muscular spasm will be. The point of maximum tenderness will be over the appendix, wherever it may be. The caput coli together with the appendix may lie beneath or anywhere between the costal margin and the pelvic floor. When located near the lower pole of the kidney or in the culdesac, the differential diagnosis becomes more difficult because symptoms of other conditions are quick to arise.

The attitude of the examiner should be one that will gain the confidence of the patient. The patient usually gives us an idea as to the location of the point of maximum tenderness when first seen. After this observation the examination should proceed on the side opposite the affected one. Many years ago Robert M. Morris of New York called attention to two points we now designate as right and left Morris points. They are located on each side of the median line just below the umbilicus. In examining the lower abdominal quadrants, we always take the left Morris point into consideration immediately after palpating the region of the sigmoid. These signs are not always present, but when positive, and it is surprising how often tenderness, rigidity, and muscular spasm are elicited here, they lend the clinician an assurance that the appendix is involved. The left sign is occasionally negative when the right is positive, but if positive on the left it is always positive on the right.

After eliciting the response to these signs, we search for the caput coli, knowing that here we will find the appendix and the point of maximum tenderness and sensitiveness. Upon sensitiveness we depend more than anything else, as an indicator of the involvement. It is the amount of involvement, estimated in our own minds, that tells us how urgent operation has become. And it is the point of maximum tenderness that gives us a cue as to the location for the incision.

FEVER AND CHILLS

Fever is practically always present in acute appendicitis and varies in the low degrees. It is the manifestation of the absorption of toxic products. Absorption cannot occur until swelling of the mucosa appears; hence, when present it always is indicative of activity. However, after activity has been established, the disappearance of a high fever and leucocyte count may be a good or bad omen. If the appendix is draining into the caput coli, it is good. If the appendiceal artery is blocked, it is bad. A gangrenous appendix does not always give pain and never absorbs toxins; hence, fever and leucocytosis may temporarily disappear only to be followed in a few hours by leakage or perforation accompanied by a spreading peritonitis.

On the other hand, when invaded by certain strains of streptococci or anaerobes, the temperature elevation may far exceed that of an ordinary case. It is in this type of infection involving the appendix that the differential diagnosis may become preeminently difficult.

When toxins are present in the appendix without absorption and the case appears in the afebrile state, one must rely principally on our old friends, pain, tenderness, and muscular rigidity, for guidance.

Chills occur with the fever only when the involving organisms and their products, or both, are thrown into the blood stream in large quantities, sometimes almost overwhelming the patient.

BLOOD COUNT

The total leucocyte count is a valuable aid in establishing a diagnosis. The polymorphonuclear leucocytes and the shift to the left described by Schilling are most helpful in determining the resistance of the patient toward the invading organism and the fulminating character. However, in a frank case of acute appendicitis the practice of sending a technician to the home for a blood count is a bad one. Not only are the history and physical findings of far greater importance, but in the end the physical findings must be the factor in the main decision — the advisability of operation. The delay brought about by this practice is not only unnecessary, but may be a contributing factor to a mortality.

CHRONIC APPENDICITIS—APPENDICOSIS

A few years ago, for lower right abdominal distress so many normal appendices were removed without relief that a period followed in which surgeons hesitated to remove the appendix in the absence of very definite fulminating symptoms. The existence of such an entity as chronic appendicitis became questionable.

For many years we have been teaching the students in the medical school that there are two kinds of appendicitis: appendicitis of the walls and appendicitis of the lumen of the appendix, or appendicosis. Appendicosis may be responsible for the development of an acute apendicitis of the walls.

The term "chronic appendicitis" from the pathologic viewpoint should be limited to certain cases of appendicitis of the wall. When infected by the usual organisms, ordinarily an appendix with wall involvement does not long lie in a quiescent state. It becomes fulminating, ruptures, and acts as a focus for a localized or diffuse peritonitis; or the inflammatory process subsides, and the round cells are replaced by fibroblasts, the process finally terminating in a mass of scar tissue formation. When attacks of acute inflammation occur at irregular intervals, we are in agreement that the process should be termed "recurrent appendicitis." We also are in agreement that if a sufficient number of attacks occur, the appendix may become a cord-like mass known as "appendicitis obliterans." Somewhere between acute appendicitis and appendicitis obliterans, chronic appendicitis must be found. The symptoms of this type of appendicitis will depend upon the complications and sequelae of previous attacks of acute appendicitis more than upon the condition of the wall of the appendix that is left in. If these are such as to produce deformities from adhesions that will interfere with physiological functions and give symptoms, this type of chronic appendicitis is a surgical disease, otherwise it is not.

The symptoms in appendicosis are quite different from those produced by appendicitis of the wall and are mechanical rather than infectious. The patient does not complain of pain, but of a discomfort over the appendix. The discomfort is an appendiceal colic due to pressure within the lumen. The appendix is signaling that it is packed and trying to empty itself. A similar discomfort is experienced in cecal stasis. In appendicosis the caput coli may be palpated but it is not so markedly distended as in cecal stasis. Neither are there positive left and right Morris signs that are significant in differentiation. When the disten-

sion is of sufficient degree, appendicosis is accompanied by nausea; cecal stasis is not. As life goes on and the lymphoid tissue in the appendix is replaced by fibrous tissue, this condition becomes less frequent; and unless all other causes of discomfort in this region have been eliminated and the patient is desirous of relief, it is not surgical.

DIFFERENTIAL DIAGNOSIS

Diseases with symptoms simulating appendicitis have been attributed to almost every disease known, from tonsillitis to tabes dorsalis. To attempt differentiation of each would require more time than might be permissible here. Nothing new has been brought to our attention in late years except possibly the abdominal symptoms of an endocrine imbalance. Therefore, with this exception we will do little more than enumerate most of the conditions ordinarily summarized in the differential diagnosis of appendicitis.

Diseases of the gall bladder, stomach, and genito-urinary system present the symptoms that most commonly are confused with those of appendicitis. In the differential diagnosis of these conditions certain prominent symptoms common to all may present themselves, viz., pain, nausea and vomiting, tenderness, rigidity, fever, increased pulse rate, and leucocytosis. Their proper interpretation at the bedside usually will decide the question of differentiation and practically always the question of hospitalization. The degree of manifestation of the symptoms will depend upon whether they are acute or chronic.

Let us first discuss the acute lesions and the ruptured gastric or duodenal ulcer.

With the symptoms of appendicitis fully in hand, let us compare the pain and tenderness as seen in the other conditions. The pain in these conditions usually is at or near the site of pathology. The tenderness likewise will be over the gall bladder or kidney, as the case might be. In perforating ulcers accompanied by leakage, the pain may extend from the costal margin to the pubis, and the tenderness is likewise extensive. Of all the acute abdomens, we believe the pain, tenderness, board-like rigidity, and muscular spasm present in ruptured gastric or duodenal ulcer are most severe. Large doses of morphine are required for relief, whereby much smaller doses relieve the pain associated with the other lesions.

We are now taught that the pain in the case of ureteral or gall bladder stone is due to a distention of the viscus from pressure of the backed-up fluid and not due as once thought to movement of the stone. The infected gall bladder always is sensitive to perpendicular percussion over the viscus. The same type of tenderness is present in kidney infections when there is retention and infection. Tenderness over the kidney on both light and deep pressure is marked in the presence of an obstruction to the ureter or at the pelvis of the kidney. The point of maximum tenderness is in the costovertebral angle. It usually can be easily elicited by placing three fingers in the angle and attempting to lift the patient when on the bed in the recumbent position. This sign may be tested on one or both sides at the same time. If not found by this method, one must resort to fist percussion. When the pain in gall bladder disease is not over the viscus, in seven out of ten cases it will be referred under the right scapula; next in point of frequency it is epigastric, and next under the right or left clavicle.

In the chronic conditions epigastric or right hypochrondriac pain, relieved with or without food, or increased after a full meal but diminished after a small one, is of importance in the differentiation of gastric and duodenal ulcers. Pain on the ingestion of food suggests a stomach involvement, while pain accom-

panying duodenal involvement usually develops several hours after eating. Sometimes the evening meal will relieve the pain experienced during the afternoon. Do not lose sight of the fact that gastric and duodenal ulcers may exist concomitantly. In either case the pain is accompanied by and probably due to distention of the viscus. In most cases of duodenal ulcer the diagnosis is made easy by the location and character of the pain. The time of onset, a disappearance of pain on the ingestion of food, the alternation of attacks with intervals of good health, abdominal distention, belching of gas, and the absence of nausea or vomiting in the presence of constipation are symptoms which, when added to the findings of hyperchlorhydria by means of a test meal, occult blood in the stool, and an ulcer deformity by means of the x-ray will, of course, remove the diagnosis from the field of the impossible. If the ulcer is located in the stomach, the pain and discomfort appear shortly after eating. These patients are seldom free of pain unless the stomach is entirely empty. Unless there is some obstruction at the pylorus or bleeding at the bed of the ulcer, vomiting is not customary. Occult blood in the stool is not seen as often as in cases in which the ulcer is in the duodenum. The almost constant presence of the gnawing sensation and distinct epigastric discomfort is helpful in the location of these ulcers.

If these symptoms are accompanied by a sense of pressure and fullness in the region of the gall bladder and if there is nausea without vomiting and flatulence, gall bladder involvement with or without stones should be suspected. The gall bladder pain also is different, often requiring morphine for relief. Vomiting also may relieve the pain. Do not overlook the skin changes that may accompany gall bladder disease or cholemia. Physical examination in these cases often elicits nothing more than points of tenderness, a palpable tumor usually is absent, and the enlargement of the stomach or stomach splashing is present only when there is some obstruction at or near the pylorus, the result of the location of the ulcer proper, scar tissue formation, or perigastric or duodenal adhesions. Those of you who do not have access to an x-ray will find the so-called motor meal helpful in determining whether or not the stomach is enlarged. Practically all of the meal should have left the stomach in four hours, and gastric lavage will relieve the pain in ulcer cases. However, since the pain recurs in a short time, it is of little practical importance.

Fever may be absent in gall bladder infection and attacks due to kidney and ureteral stones. In infections of the gall bladder fever varies in the moderate degrees; while in infections in the genitourinary tract, fever reaches the peak. Ascending infections of the ureter develop in about ten days following a primary unrelieved infection of the urinary bladder and of course is usually accompanied by fever.

The diagnosis of appendicitis in children and the aged, because of sclerotic changes in the vessels in the latter, is much more difficult than in the young or middle aged adult, but localized pain, tenderness, and rigidity following a period of constipation are almost pathognomonic.

Time will not permit the discussion of conditions of the abdomen due to affections of the lung and kidney, abdominal symptoms and heart disease, tabes, tuberculosis, etc., but they usually are considered before reaching a decision. Distention after eating, epigastric fullness and lower right quadrant distress, when seen in primary or secondary hypogondal individuals, should not lead one astray.

Judgment is the backbone of all things but cannot be taught. It may be gained only by experience and it is indeed unfortunate that we cannot pass it along.

If the clinical picture is against the disease under consideration, if the disease is not acting as it should according to its duration, and if the physical findings are not in keeping with the clinical picture in general, defer operation until such a time as developments are satisfying.

TREATMENT OF APPENDICITIS AND ITS COMPLICATIONS

The treatment of appendicitis now is considered surgical beyond question, but the technic of operation seems to be a matter of individual taste. We should have passed through three eras of surgery — the antiseptic, aseptic, and anatomic — and should now be in the fourth or physiological. During the aseptic era we feared the microbe because Leuwoenhok of Delft had proved its existence. During the anatomic era we feared nothing, because asepsis had taught us that in the absence of germ life the human body could be subjected to many kinds of long incisions, and the viscera could be manipulated in a hitherto undreamed of manner. Long incisions and extensive manipulations became quite popular. It was said that long incisions would heal as quickly as short ones, so why not use them and take a good look? Explorations became quite common, prolonged the operation, revealed little, and in many cases were dangerous. In time it was found that long incisions, except in the skin, did not heal as readily as short ones. Patients who had had incisions from the ensiform cartilage to the symphysis pubis began to come back with large ventral hernia. These hernia were hard to repair. Patients died from complications, such as pneumonia, and secondary repairs were not always successful.

Something had to be done about this and so we entered the physiological era in which most of us should now be working. Careful study should be made of all patients before subjecting them to operation. X-ray examination of patients in suspected acute appendicitis is of little value. Because of the delay and required manipulation of the patient's abdomen, probably such an examination seldom is justified; flat pictures, however, may aid in determining the presence or absence of gas in perforating ulcers.

On the other hand, with patients suspected of having chronic appendicitis, an x-ray examination is of the greatest value; and whenever there is any doubt about the diagnosis, it should not be omitted. Such findings as tenderness over the appendix which shifts with its change in position, fixation of the appendix, and pain referred to other parts of the abdomen by pressure on the appendix are valuable diagnostic signs elicited by x-ray examinations. Should the appendix not be normally situated, the x-ray will reveal the abnormal location. Besides the direct signs of appendiceal involvement, such examinations as cholecystography, the barium meal examination of the stomach and duodenum, the examination of the colon, and the examination of the urinary tract for calculi help eliminate most of the conditions confused with appendicitis. In suspected acute appendicitis in children, we like to have our roentgenologist assure us that his films do not show any involvement of the right lung with referred pain into the lower right abdomen before we proceed with an operation.

After collecting all the data possible on a case, the operation should be planned with the view of subjecting the patient to the least possible risk. Once a diagnosis is established, the operative procedure should be governed accordingly. Should the pathology necessary to account for the symptoms not be found on the approach of the affected part, then and then only is exploration justifiable. Our leading authorities now agree that neither the hand nor the eye can find more than five per cent of the abnormalities that cannot be found before exploration.

OPERATION

In acute cases the adult is routinely given one-fourth of a grain of morphia and one-hundred-fiftieth of a grain of atropine as soon as practical after operation is decided upon and the abdomen is shaved. After removal to the operating room, the patient is anesthetized according to the preference of the anesthetist, there being no preference in the selection of an anesthetic in acute appendicitis. Ether is said to be harmless, but we prefer gas.

After the patient is anesthetized, the abdomen is painted with tincture of iodine. The incision is of the gridiron type and is located over the appendix, the location having been determined prior to operation by the point of maximum intensity, rigidity, and muscular spasm. After delivery and detachment of the meso-appendix from the appendix, the base of the appendix is crushed with a hemostat. With the same ligature, usually plain catgut No. 1, the appendix and meso-appendix are ligated, the appendix first and the meso-appendix second. With another ligature both the appendix and the meso-appendix are tied. The second ligature serves a double purpose of reinforcing the first and supporting the stump during its sterilization. For this purpose carbolic acid or cautery is used. After sterilization of the stump the meso-appendix is tied over it with the same ligature. The stump then is returned to the abdominal cavity, due care being exercised not to permit contamination of the abdominal wall. Tube and tissue drains are used according to indications, and the abdominal wall is left open or closed with the least amount of catgut permissable. We seldom use more than 30 inches of catgut in completing the operation for removal of the appendix.

If peritonitis is present or expected, the patients are cared for according to an outline that will be given later.

COMPLICATIONS

The principal complication of acute appendicitis is peritonitis. This may be localized or diffused. Its extent usually may be determined at the time of operation, and its treatment, of course, will depend upon how extensive the process has become. Often one can determine the extent of the peritonitis before opening the abdomen, and to treat it intelligently one should be familiar with the anatomy of the peritoneum and the character of the invading organism.

On opening the peritoneum one may encounter free fluid. This fluid may be offensive or defensive. If defensive, the transudate contains polymorphonuclear leucocytes and lymphocytes. The protective flakes seen in the fluid and the lymph seen scattered about the bowels contain endothelial cells. These cells are essential to the absorptive defensive integrity of the bowel. If disturbed, the lymph spaces beneath are opened up and permit overwhelming absorption. Hence, the least manipulation possible in frank cases of acute appendicitis accompanied by this fluid produces the best result for the patient. In these cases drainage may or may not be employed, but when we use drainage we feel better because it is difficult, indeed, to say at what time during the course of the disease this defensive transudate will become an offensive purulent material. Then, too, the wound will suppurate in practically all cases.

After removal of the appendix or the closure of a perforation, drainage should be instituted in all cases of frank infection, particular attention being paid to the dependent portions of the abdomen, according to the case. No one can tell me this point is of no importance. In appendiceal cases, if the caput coli lies beneath the brim of the true pelvis, the culdesac should have first consideration. Further, it should not be overlooked in any case, else when the patient is doing well after operation, a culdesac drainage through the bowel may become necessary. If the caput coli lies above the brim, drainage may be necessary as high as the duodenohepatic fossa. Place the drains in such a manner as to relieve the tension and keep it relieved. The less the tension, the less the absorption. The better the drainage the first 24 hours when the peritoneal cavity is full of pus,

the better the prognosis. This cannot be expected, however, in invasions by streptococci, since the invasion takes place principally in the peritoneal and subperitoneal lymph spaces.

POSTOPERATIVE CARE

Peristaltic rest is of prime importance as is duodenal drainage through the nasal tube. The green duodenal content is the thing that kills the patient. Let the tube siphon it into a container on the floor.

Regardless of the apparent extent of peritoneal involvement, all cases of acute grade four appendicitis and peritonitis are treated expectantly until the abdomen is soft and flat with little distension and rigidity, and the temperature and pulse are at or near the normal.

Unless there is some special contraindication, we operate in cases of acute appendicitis as soon as the diagnosis is established and treat the peritonitis according to the findings at operation. By so doing we control the advance of the disease. Morphine is given for its physiological effect, this being governed by the respiratory rate. The ideal respiratory rate is near twelve. At this rate there is no peristalsis. If the rate should reach eight, withhold the morphine until the rate begins to increase. If the morphine does not act well, use deodorized tincture of opium in forty drop doses. Give it in one ounce of water as a rectal injection. Digitalis is given intravenously with a venoclysis or intravenous injections. If the case is in extremis, give 5 cc. during or immediately after operation. If there is no improvement, repeat in 12 hours and give 1 cc. every 24 hours thereafter. This amount is sufficient to keep up the physiological effect because of its cumulative action. Continue the digitalis until there is a decrease in rate and an increase in amplitude or tension of the pulse, or nausea or diarrhea indicating toxicity from the drug.

Nothing is given by mouth or rectum until we are satified that no damage can be done by it. We then proceed cautiously. We first allow one ounce of water by mouth every hour for 24 hours. If this produces nausea, distension, or increase in the pulse rate, it is immediately withdrawn. If not, one ounce of any liquid except milk is allowed every hour the second 24 hours. Then, if well tolerated, liquids ad lib are given until peristalsis is reestablished. The patient then is placed on a soft diet.

To support the patient during this time, we inject intravenously 750 cc. of 5 per cent dextrose (about 400 calories in salt solution with 15 units of insulin (1 unit to each 3 Gm. of sugar) at least every 12 hours, or use a venoclysis with the same solution. The salt solution supplies the chlorides; the dextrose, the food; the water, the fluids; and the insulin burns up the excess sugar. If the progress is not satisfactory, as evidenced by a diminution of the distension with a dropping temperature and pulse rate, blood transfusions of 500 cc. of citrated blood are given daily as an adjunct. The pulse rate should serve as a guide, but do not be misled by the digitalis effect. Use as little digitalis as possible and watch for danger signals.

Of course, if the patient is in extremis when seen and dehydration is marked, sufficient fluids must be supplied to take care of the loss, estimated at six per cent of the body weight. The average normal adult in bed, weighing 150 pounds, requires 1,800 calories daily to prevent loss of weight and two or three quarts of water to prevent dehydration. This amount of fluid, therefore, plus the normal daily intake would likely be required to supply the loss before the patient could be put on so-called routine. Although it is safe to give six or eight quarts of fluid in the beginning, too much can be given and tends to produce edema. I have seen pulmonary edema,

the result of too much fluid parenterally, mistaken for a failing heart. Watching the blood chemistry is very helpful and will keep us out of a lot of trouble.

THE RISING MORTALITY

The younger surgeons of today, with four years each in college and medical school and two to five years in the hospital, have little regard for the old man with experience. They feel their judgment is as good, or probably better (and it may be in some cases) than his. The public joins the younger surgeon in this idea, too. He is more modern, better trained! Yet is there anything that will take the place of experience (if one is capable of benefiting by it)?

Ill advised operation undoubtedly increases the risk.

Duration of the disease has nothing to do with "the time to operate." Symptoms may be mechanical. As long as the inflammatory process is limited to the appendix, we may operate any time with impunity and with the expectation of the irreducible minimum mortality, which accompanies all operations.

Furthermore, it is safe to operate as long as the inflammatory reaction is limited to the walls of the appendix and the peritoneum in the immediate vicinity thereof.

But when the appendix has ruptured and is accompanied by a spreading peritonitis, characterized by evidence of diffuse infection (high temperature and pulse rate, distension, dehydration), it is better to treat the patient expectantly — that is, withhold food and drink by mouth and in the early stages by rectum —, giving supportive measures by vein (hypodermoclysis and medication hypodermically). Permit abscess formation; after abscess formation, permit resolution, unless pulse, temperature, and general conditions become alarming, in which case, drain. Use the smallest possible gridiron type of incision with a minimum amount of trauma.

In a series of 500 consecutive cases of appendicitis without concomitant disease reviewed recently by my associate, Dr. C. C. Reed, Jr., and myself, we made the following observations.

These patients were all treated at St. Vincent's Infirmary, Little Rock.

Hospital Admissions (By years)	*Personal Admissions*	*Appendectomies*	*Deaths*
1926 3152	646	44	2
1927 3695	756	93	1
1928 3586	725	85	4
1929 3911	804	90	4
1930 3514	734	86	5
1931 3657	608	62	6
1932 3267	645	50	3

Our cases were analyzed as follows:

Incidence and Symptoms:

DISTRIBUTION: 500 consecutive cases: 278 acute, 154 subacute, 68 chronic. All surgical. Male, 263. Female, 237. Oldest, 67 years. Youngest, 3 weeks. Average, 26 years plus.

DURATION OF ATTACK ON ADMISSION: Acute Cases: longest, 21 days; shortest, 6 hours. Subacute Cases: longest, 9 months; shortest, 12 hours. Chronic Cases: longest, 12 years; shortest, 3 years.

LOCATION OF PAIN: Diffuse, 168. Epigastric or umbilical, 107. McBurney's point, 225.

ONSET: Nausea, 360. Vomiting, 235. Nausea and vomiting not mentioned in others.

NUMBER OF ATTACKS: First, in 222. Second, in 106. Third, in 113. Others, 60.

URINE: Pus, 193. Blood, 19. Albumen, 73. Casts, 42. Not examined in 18.

WHITE COUNT: Cases, 338. Highest, 36,000. Lowest, 4,000. Average, 11,950. Not done in 162.

Operations:

INCISION AND DRAINAGE: Buttonhole, 336. McBurney gridiron, 110. Incision and drainage, 24. Drains used in 175.

PATHOLOGY: Suppuration, 225. Gangrene, 137. Perforation, 78. Fluid, 79. Pus, 106. Abscess, 37.

PERITONITIS: Diffuse, 242; localized, 113. Acute cases without peritoneal involvement, 77.

WOUND INFECTION: In the 77 acute and 68 chronic cases there were 6.

Stay in Hospital:

CLEAN CASES: Longest, 27 days. Shortest, 4 days. Average, 8 days.

CONTAMINATED: Longest, 62 days. Shortest, 6 hours. Average, 13 days plus.

TEMPERATURE: Highest, 103.6. Lowest, 96.4. Average, 99.6.

PULSE: Highest, 144. Lowest, 56. Average, 90.

RESPIRATION: Highest, 50. Lowest, 16. Average, 22.

Complications:

Bronchitis, 7; pyelitis, 7; pneumonia, 4; pleurisy, 3; parotitis: bilateral, 3, unilateral, 2; cystitis (left), 2; phlebitis (left), 2; coryza, 1; pregnancy, 1; nephritis, 1; fecal fistula, 1; wound sepsis, 1.

Reentries:

Ventral postoperative hernia, 2; intestinal obstruction, 2; pericecal abscess, 2; impacted feces, 1; diverticulitis of sigmoid, 1.

Oversights:

No record referred to familial tendencies or constipation. Diarrhea was referred to in 12 cases, cathartics in 47 cases, enemata in none.

Deaths:

TOTAL NUMBER: 25.

PRIMARY CAUSE: All cases, acute appendicitis. Complications: Diffuse Peritonitis, 23 cases; hyperthyroidism, 2 cases.

SECONDARY CAUSE: Diffuse peritonitis, 9 cases; septicemia, 6; pneumonia, 4; embolism, 3; hyperthyroidism, 2; secondary hemorrhage, 1.

Recapitulation:

NO. OF CASES: 500.

NO. OF DEATHS: 25.

AGE: Youngest, 3 weeks. Eldest, 52 years. Average, 26 plus.

SEX: Male, 17. Female, 8.

DIAGNOSIS: Clinical and pathological agreed in all cases. Acute: Grade 4.

DURATION: Shortest, 1 day. Longest, 7 days. Average, 4 days plus.

PAIN: Diffuse, 17. McBurney, 4. Epigastric, 4.

NAUSEA: 21.

VOMITING: 20.

PREVIOUS ATTACKS: First in 22. Second in 2. Fourth in 1.

CATHARTICS: 10. Not stated in 15.

URINE: Pus, 11. Blood, 1. Albumen, 10. Casts, 7.

BLOOD: W.B.C.: Highest, 22,500. Lowest, 9,600. Average, 14,750.

OPERATION: Buttonhole, 13. Gridiron, 6. Incision and drainage, 6.

DRAINAGE: All cases.

PATHOLOGY: Gangrene, 23; perforation, 13; suppuration, 25; abscess, 10; perforation, caput cecum, 1; peritonitis: diffuse, 25, local, none; pus, 22; fluid, 3.

TEMPERATURE: Highest, 103. Lowest, 96.6. Average, 99.8.

PULSE: Highest, 144. Lowest, 58. Average, 100 plus.

RESPIRATION: Highest, 50. Lowest, 18. Average, 24.

STAY IN HOSPITAL: Longest, 52 days. Shortest, 18 hours. Average, 8 days plus.

RESULTS: Answers to questionnaires in 68 chronic cases: relieved, 32; not relieved, 7; unclaimed, 12; unanswered, 17.

SUMMARY

The United States leads all other countries in deaths from appendicitis. The disease takes 20,000 people annually and is the cause of one death every 26 minutes. If prompt and proper treatment is given, the mortality should not exceed one in every 240 cases. There are two kinds: appendicitis of the walls and appendicitis of the lumen of the appendix, or appendicosis. The latter may be responsible for the development of the former. Chronic appendicitis should be limited to certain cases of appendicitis of the wall. Chronic appendicitis and appendicosis may or may not be surgical. Acute appendicitis is considered surgical beyond question. Means of differentiating between appendicitis and other diseases which may simulate it are given. The author's technic of operation is described. An analysis of 500 cases treated at St. Vincent's Infirmary, Little Rock, is presented, in which there were 25 deaths.

RÉSUMÉ

l'Appendicite: sa différenciation

Les décès dus à l'appendicite sont plus nombreux aux Etats-Unis qu'ailleurs. La mortalité annuelle est de vingt mille. Il y a un décès dû à l'appendicite chaque

vingt-six minutes. L'opération précoce et pratique selon les règles ne devrait donner qu'un décès pour 240 cas. Il y a deux types: l'appendicite intéressant les parois de l'organe, et l'appendicite intéressant la lumière de l'organe. Cette dernière forme en se propageant à la paroi peut nous donner la deuxième forme. Pour l'appendicite aiguë, le traitement opératoire s'empose. Il y a des cas d'appendicite chronique qui ne réclament pas un traitement opératoire. L'auteur discute le diagnostic différentiel car il y a des processus pathologiques qui simulent l'appendicite. L'auteur décrit sa technique. Il analyse cinq cents cas soignés a l'Infirmerie de St. Vincent, Little Rock, Ark. Ces cas donnèrent vingt-cinq décès.

ZUSAMMENFASSUNG

Differentialdiagnose der Blinddarmentzündung

Die Sterblichkeit bei der Appendicitis ist in U. S. A. grösser als in allen anderen Staaten. Von dieser Krankheit werden jährlich 20,000 Personen befallen und sie verursacht einen Todesfall alle 26 Minuten. Bei schneller und richtiger Behandlung sollte die Sterblichkeit nicht über einen Tod in 240 Fällen hinausgehen. Es gibt zwei Arten; eine Appendicitis der Blinddarmwand und eine Entzündung des Lumens, die auch Appendikosis genannt wird. Das letztere Stadium ist vieleicht für die Entwicklung des ersteren verantwortlich. Der Ausdruck „chronische Appendicitis" sollte auf bestimmte Fälle, bei denen eine Entzündung der Blinddarmwand vorliegt, beschränkt werden. Chronische Appendicitis und Appendikosis, können, aber müssen nicht chirurgisch sein. Es steht ausser Frage, dass eine acute Blinddarmentzündung immer vom chirurgischen Gesichtspunkt aus betrachtet werden muss. Es werden verschiedene Methoden angegeben um eine Differentialdiagnose zwischen Appendicitis und anderen ähnlichen Krankheitszuständen machen zu können. Die Operationstechnik des Verfassers wird beschrieben. Die 500 im St. Vincent Infirmary, Little Rock, behandelten Fälle werden analysiert, unter denen 25 Todesfälle vorkamen.

SUMARIO

Apendicitis: Sus Diferenciaciones en Tratamiento

Los Estados Unidos estan á la cabeza de todos los otros paises en muertes por apendicitis. La enfermedad toma 20,000 personas anualmente y es la causa de una muerte cada 26 minutos. Si el tratamiento es dado prontamente y en la manera propia, la mortalidad no debe de exeder á uno en cada 240 casos. Hay dos clases: apendicitis de la pared y apendicitis de la cavidad apendicular, ó apendicósis. La ultima puede ser responsable por el desarrollo de la primera. Apendicitis crónica deben de ser limitadas á ciertos casos de apendicitis de la pared. Apendicitis aguda es considerada, sin duda alguna, quirúrgica. Medios para diferenciar entre apendicitis y otras enfermedades que puedan simularla son dados. La tecnica de el autor para la operación es indicada. Un analisis de 500 casos tratados en la Enfermeria de San Vicente, Little Rock, es presentado, en el cual hubieron 25 muertes.

RIASSUNTO

L'Appendicite: La sua differenza e la sua cura

Gli Stati Uniti precedono tutti gli altri paesi nei morti dall'appendicite. L'infermità prende ventimila persone annualmente ed è la causa d'una morte ogni ventisei minuti. Se si dà pronta ed adatta cura, la mortalità non eccederebbe uno in ogni duecentoquaranta casi. Ci sono due specie: L'appendicite delle pareti e l'infiammazione del canale appendicolare. Questa puo' essere risponsabile per lo sviluppo di quella. L'ap-

pendicite cronica si dovrebbe limitare a certi casi dell'appendicite della parete. L'appendicite cronica e l'infiammazione del canale appendicolare possono essere o non possono essere chirurgiche. L'appendicite acuta è considerata chirurgica oltre ogni dubbio. I mezzi di differenziare fra l'appendicite e le altre infermità le quali possono stimolarla sono dati. Il tecnico dell'operazione dell'autore è descritto. Un'analisi di cinquecento casi trattati all'Infermeria di San Vincenzo, Little Rock, è presentata, nella quale ci furono venticinque morti.

VISIT THE EXHIBITS AT NATIONAL ASSEMBLY

Phospho-Soda (Fleet)

Phospho-Soda (Fleet), to be on exhibit at Booth No. 16, is a highly concentrated and purified, aqueous solution of sodium phosphates. It is non-toxic, rapid but mild in action without irritation of the gastric or intestinal mucosa. Indicated for hepatic dysfunction, and for its thorough eliminating and cleansing action on the upper and lower gut.

DePuy Manufacturing Company

The DePuy Manufacturing Company invites you to visit Booth No. 11. The new Littig Nail Guide, which permits accurate driving of a Smith-Petersen solid Nail, will be on display. They will also show the new Wire Clamp for holding transverse fractures of the heads of the tibia, the new five chuck Drill for inserting Drills, Pins and Wires in traumatic surgery, Vitallium Bone Plates and Screws and 18-8 non-magnetic Nails for treating hip fractures. A complete line of bone appliances will be on display for your inspection.

J. B. Lippincott Company

Among the featured LIPPINCOTT publications on display will be the phenomenally successful Thorek's "Modern Surgical Technic" and the new book on "Shock—Blood Studies as a Guide to Therapy" by Scudder. Dickson and Diveley's "Functional Disorders of the Foot" is still meeting with wide acclaim as is the third and latest volume of Kirschner's "Operative Surgery" on "Ear, Air Passages and Neck" translated by Ravdin and Coates.

Comper Manufacturing Company

The Albee-Comper Fracture Table incorporating new methods of Posturing and of applying Traction to both upper and lower extremities will be demonstrated at Booth No. 26. Unusual facilities for control of patient in comprehensive orthopedic postures under traction, and unprecedented advantages for X-Ray examination and check are provided on this unique Fracture Table. The Comper Invalid Walker, Weinberger Hand-Traction, Golden Localizer for Hip Fixation will also be on exhibit.

Bell & Howell

Bell & Howell Company will display the Turret type 70-DA camera in booths 1 and 2. This camera, which permits quick easy switching of its three lenses, has been a leading instrument for years in the taking of medical motion pictures. All accessories for taking a fine picture will be included in the display. Silent and sound projectors, of the very latest type, will be demonstrated. Noteworthy among these will be the 'Filmomaster' silent projector, a quiet running all-gear driven 16 mm. machine. In addition to giving equipment information, booth attendants will be glad to inform visitors regarding all the various medical film sources.

Heidbrink Kinetometers

In Space 18 will be found a complete display of the well known Heidbrink Kinetometers, Airators, Tents, and other therapy equipment, as well as the Ohio Oropharyngeal Catheter Outfit.

THE INDICATIONS AND CHOICE OF SURGICAL PROCEDURES IN GALLBLADDER DISEASE

WITH A DISCUSSION OF CONTROVERSIAL POINTS*

From the Services of the Jewish and Mount Sinai Hospitals

MOSES BEHREND, M.D., F.A.C.S., F.I.C.S.

PHILADELPHIA

THE topics to be considered in this paper are the transverse or subcostal incision versus the longitudinal incision, immediate or delayed operation for acute inflammation of the gallbladder, cholecystectomy versus cholecystostomy, drainage versus no drainage following cholecystectomy, cholecystectomy in the presence of jaundice, cholecystectomy from above or below the liver border, reasons for opening the common duct, T tube versus straight tube for drainage of the common duct and the best anesthetic to use for upper abdominal operations.

TRANSVERSE VS. LONGITUDINAL INCISION

I cannot speak from personal experience concerning the advantages of the transverse or subcostal incision. It is claimed that the upper abdominal contents can be more easily explored and operated upon through the transverse incision, and that incisional hernia develops less frequently following this technic. One disadvantage is that the appendix cannot always be reached through this incision. It would be necessary, therefore, to make an additional incision if an appendectomy is contemplated. The technical procedures performed through the transverse incision can be accomplished just as well through a vertical incision. When a vertical incision is used in women patients, it is always possible to remove the appendix and examine the genital organs. An additional incision may be necessary occasionally in men to perform an appendectomy. Incisional hernia has occurred less frequently following the vertical incision since spinal anesthesia has been used.

For the past ten or twelve years, during which spinal anesthesia has become the method of choice in all upper abdominal operations, I have changed the location of my vertical incisions. Formerly it was customary to start the incision in the epigastric region, but in using spinal anesthesia the epigastric region was not always anesthetized. It is now my custom to incise the abdomen in a vertical direction directly over the location of the gallbladder, which is approximately at the right border of the rectus muscle.

IMMEDIATE OR DELAYED OPERATION

Controversy has permeated the profession for some time as to whether it is better to operate upon a "hot gallbladder" or to wait until it has "cooled off" before performing cholecystectomy. Much depends on whether "acute cholecystitis" is a clinical or a laboratory diagnosis. This causes confusion because the laboratory diagnosis of "acute" inflammation of the gallbladder may have been made after the subsidence of the attack; operation can therefore be performed with safety. But a gallbladder that is clinically acute gives very definite signs of marked tenderness

*Read before the Section on General and Industrial Surgery, Philadelphia County Medical Society, December 11, 1939.

and rigidity with a mass in the right hypochondriac region, accompanied by high fever and rapid pulse.

There is absolutely no danger in waiting for a gallbladder to "cool off." The important requisite, however, is that the patient be hospitalized. He should receive absolutely nothing by mouth. All nourishment should be given parenterally. Then practically every inflamed gallbladder will subside within 12 to 24 hours. The tenderness over the right hypochondriac region subsides, the mass is reduced, the pulse and temperature return to normal. Under this treatment perforation need not be feared at all because in only one instance in my experience has a perforation occurred during the waiting period. Even in this case the symptoms were allowed to subside and operation was not performed until five or six days following the admission of the patient to the hospital. It was not known that perforation had occurred until the time of operation because the gallbladder was adherent to the parietal peritoneum. Our experience with acute perforation of the gallbladder includes the history of one other patient. In this case an immediate operation was performed and the patient recovered because the signs and symptoms of the rupture with general peritonitis were recognized. The pathologic anastomoses of the gallbladder to the stomach and duodenum seen at operation are evidence that perforations to contiguous organs occur fairly frequently, but rarely cause diffuse peritonitis.

As a result of emergency operations for acute empyema of the gallbladder, the morbidity and mortality will be greater. By emergency is meant an operation that is performed within an hour or two after the patient's admission to the hospital. One prominent surgeon reported a mortality of 50 per cent following cholecystectomy for acute empyema of the gallbladder. He has now modified his procedure by performing cholecystostmies only in acute cases. As a result of the liver damage encountered in acute cases, it is obvious that deaths following cholecystectomy will increase. Sufficient time should always be allowed for the estimation of the blood chemistry, the administration of glucose, blood transfusions when necessary, and the ultimate subsidence of symptoms as gauged by palpation of the abdomen. Again, many patients operated on in the acute stage must undergo two operations: a cholecystostomy, followed in about four to six weeks by a cholecystectomy. Convalescence following the second operation is usually a stormy one.

CHOLECYSTECTOMY VS. CHOLECYSTOSTOMY

As a surgical procedure the superiority of cholecystectomy over cholecystostomy was acknowledged many years ago. The pioneers in this type of work believed that cholecystostomy had a lower mortality than cholecystectomy. The actual experience of surgeons showed that this was an erroneous conclusion. At the present time there is a mild enthusiasm again for the return of the operation of cholecystostomy. This may be due partly to the fact that many surgeons are advocating operations upon acute empyema of the gallbladder as an emergency measure.

There is a very limited field for the operation of cholecystostomy. It may be performed on patients who are very bad risks, in the aged, in acute conditions of the gallbladder, in acute pancreatitis, and chronic cholecystitis without stones. Cholecystostomy may also be done in those patients in whom a diagnosis of high-lying acute appendicitis has been made, but in whom instead an acute empyema of the gallbladder has been found at operation.

CHOLECYSTECTOMY IN JAUNDICE

Before we were aware of the thera-

peutic value of vitamin K and bile salts, cholecystectomy in the presence of jaundice was a dangerous procedure. Many patients died as a result of the uncontrollable oozing which followed stripping of the gallbladder from the liver. It is now safe to perform a cholecystectomy during the course of an operation on the common duct provided the thrombogenic time has first been estimated and the proper dose of vitamin K and bile salts has been administered.

To all jaundiced patients vitamin K and bile salts should be given four days before operation and continued for at least a week after operation.

METHOD OF APPROACH

While the gallbladder may be removed from above, the preferable method is the one that attacks the blood supply first. It then becomes an anatomic operation because after the right free border of the gastrohepatic omentum is opened, the ducts and the blood vessels are reached at their origin. When the gallbladder is removed from above downwards, the field of operation is covered with blood as a result of its separation from the liver. The oozing of blood from the liver surface is always annoying and prevents proper visualization of the structures.

DRAINAGE AFTER CHOLECYSTECTOMY

For many years I advocated drainage of the gallbladder fossa following cholecystectomy. For the past 10 or 12 years exactly the reverse has been my rule. It is now the exception to drain, but the field of operation must be free of blood and bile during the operation. Should leakage accidently occur during the removal of the gallbladder, the area must be drained. Convalescence without drainage is smoother than in those in whom the operative site has been drained. It has been necessary in three patients to reopen the abdomen and insert a drain. One patient required a posterior colpotomy, the only one who died from bile peritonitis following the "no drainage" technic.

The occurrence of subhepatic or subphrenic collections has been less following the "no drainage" technic. In clean cases when patients were drained a secondary infection sometimes developed. This lead in several cases to the formation of a subphrenic abscess.

EXPLORATION OF COMMON DUCT

The indications for the exploration of the common duct during the operation of cholecystectomy are a previous history of jaundice, a dilated thick-walled common duct, and one in which stones can be felt. Stones were present in 12 to 19 per cent of the patients who had cholecystectomy done. It must be distinctly understood that in every case in which the common duct is opened there is additional danger both as to morbidity and mortality. After the duct is incised and the various instruments for the removal of the stones have been utilized, the duct should always be syringed under pressure in order that adherent sand and stones may be removed from the common and hepatic ducts. Special attention must be given those stones that are embedded in the ampulla of Vater. Since it is impossible to remove them through an incision in the common duct, a transduodenal operation must be performed. A choledochogram done at the time of such operation is important, but the operating room must be properly equipped to carry out this plan. After the operation another choledochogram is taken in order to determine whether the common duct is patulous and free of stones.

T TUBE VS. STRAIGHT TUBE

Nothing introduced in surgery of the common duct is more useful than the method of drainage of it with the T tube following operations on this structure. For this purpose, of greatest im-

portance is the selection of the proper size of T tube, commensurate with the caliber of the duct; the ease with which the tube may be introduced depends on this relationship. The question, "How long should the T tube remain?" has often been asked. In patients in whom there is a tendency for stones to reform in the common duct the tube should remain for six months or more. While we do not feel that the continued presence of the T tube in the duct will prevent the formation of stones, it will, however, by daily washings with salt solution, prevent the accumulation of bile sand and mud which may eventually form a definite obstruction. In other cases where we have proved by means of a choledochogram that the ampulla of Vater is patulous, it may be necessary to leave the tube only about two weeks. When a stone has been left in the common duct and we wish to apply the treatment recommended by Walters, which is to dissolve the stones, the presence of the T tube is the only method by means of which this measure can be carried out. The treatment consists in the administration of nitroglycerin and the injection of ether to dissolve the stones. With us this treatment has not been successful. As intimated above, the T tube should never be removed until a choledochogram has been used to prove that bile passes into the duodenum.

The T tube is of special benefit in cases of chronic pancreatitis where no stones are found in the gallbladder or ducts, when external drainage may be used for six months or more beneficially. Internal drainage by some form of anastomosis of the bile passageways to the stomach or duodenum is a preferable method for some of these cases.

A straight tube for drainage of the incised common duct is not as universally efficient as the T tube, as it is apt to slip, whereas a T tube will remain indefinitely, rarely being displaced of its own accord. The T tube may remain six months or more in patients with chronic pancreatitis and in those in whom stones recur frequently in the common duct. By far, then, the use of the T tube is the best method of draining the common duct.

CHOICE OF ANESTHETIC

Every known anesthetic has been used in operations upon the bile passageways. The finest judgment in the selection of the proper anesthetic in operations upon the diseased bile passageways must be employed. While we do not know the cause of liver deaths, the anesthetic may be instrumental in bringing about some of these fatalities. It has been shown that in all types of inhalent anesthetics, considerable liver damage in the form of necrosis may result. Since the use of spinal anesthesia, which is probably the least harmful of all anesthetics, the number of liver deaths has been materially reduced. While liver necrosis may result following any form of anesthetic, spinal anesthesia is responsible for very few. It is the safest that one can use in all abdominal operations, especially in those performed in the upper abdomen. In addition to the resultant ease with which one can operate because of relaxation, it conserves liver cells. The real danger of spinal anesthesia is the sudden and maintained drop in blood pressure which must always be guarded against to prevent anoxemia. The main factors to prevent the drop in blood pressure are a prophylactic dose of neosynephrin or like products and intravenous injection of five per cent glucose at the time of operation and, if necessary, a repeated dose of the above drug during the operation.

CONCLUSIONS AND SUMMARY

1. There is no advantage in the use of transverse over the vertical incision.

A better examination of the abdomen can be made with the latter method.

2. An emergency operation should never be performed on acute empyema of the gallbladder. There is always an opportune time at a later date when a cholecystectomy can be performed.

3. There does not seem to be any justification for the preference of cholecystostomy, inasmuch as a cholecystectomy has been proved for many years past the superior operation.

4. Provided one is sure of the technic, drainage after cholecystectomy is unnecessary.

5. Cholecystectomy in the presence of jaundice is now a safe operation provided vitamin K and bile salts are administered before and after operation.

6. Cholecystectomy should always be performed from below.

7. The common duct should always be explored if dilated, if a previous history of jaundice has been obtained and if stones are present.

8. The T tube is a necessary adjunct in the performance of surgery of the common duct. The straight tube has a limited application only.

9. Spinal anesthesia is the safest of all anesthetics in upper abdominal surgery.

RÉSUMÉ

Indications et choix de procédures opératoires dans les maladies de la vésicule biliaire

Après avoir présenté les opinions contraires sur la question, l'auteur affirme que l'incision transverse est préferable à l'incision verticale; la cholecystectomie est préférable a la cholecystostomie; le drainage n'est pas nécessaire. Même dans les cas où il y a jaunisse, la cholécystectomie n'est pas une operation dangereuse si on administre au malade avant et après l'acte opératoire des vitamines et des sels biliaires. Si le cholédoque est dilaté, il faut l'explorer. On explore à ce conduit aussi si le malade a eu des attaques précedentes des jaunisse, si des calculs sont presents. Le tube en T est un accessoire utile dans la chirurgie du choledoque. L'anesthésie rachidienne offre le plus de securité, pour les interventions de la cavité abdominale supérieure.

ZUSAMMENFASSUNG

Indication und Wahl der Gallenblasenoperationen

Der Verfasser kommt, nachdem er die verschiedenen Gesichtspunkte erörtert hat, zum Schluss, dass die Querincision der vertikalen vorzuziehen ist. Eine sofortige Operation soll nicht vorgenommen werden, wenn ein akutes Empyem vorliegt. Cholecystektomie ist vorteilhafter als Cholecystostomie. Drainage ist nicht notwendig Cholecystektomie in Gegenwart von Ikterus ist zu einer ungefährlichen Operation geworden, vorausgesetzt, dass Vitamin „K" und Gallensalze vor und nach der Operation verabreicht werden. Die Operation sollte von unten vorgenommen werden. Der Ductus Choledochus muss untersucht werden, wenn es erweitert ist, wenn Steine vorhanden sind, oder wenn der Patient früher Ikterus hatte. Ein „T" Drain ist ein notwendiges Utensil für Operationen am Ductus Choledochus. Spinale Anaestesie ist für alle Oberbauch Operationen die sicherste Narkoseart.

SUMARIO

Indicaciones y procederes quirúrgicos á escoger en las enfermedades de la vesícula biliar

Las concluciones á que se llegaron despues de la presentación de ambos lados de la discución es de que las incisiones transversales son preferidas á la vertical; una operación de emergencia nunca debe de ser hecha por un empiema agudo de la vesícula bilear; colecistectomia es superior á la colecistosto-

mia; el drenage no es necesario, colecistectomia en la presencia de ictericia no tiene peligro ahora, siempre que vitamina K y sales biliares sea administrada antes y despues de la operación. La operación debe de ser hecha de abajo. El conducto comun debe de ser explorado si está dilatado y si una historia previa de ictericia ha sido obtenida y si piedras estan presentes. El tubo T es muy necesario en cirugía del conducto comun. Anestesia espinal es la mejor de todas las anestesias en cirugía de la parte superior del abdomen.

RIASSUNTO

Indicazioni e scelta di procedimenti chirurgici nella malattia della cistifellea chirurgici

Dopo la presentazione di tutti e due i lati del soggetto, le conclusioni raggiunte sono che l'incizione trasversale è preferibile alla incizione verticale; un' operazione di emergenza non si deve mai fare per acuta empiema della cistifellea; la colecistectomia è superiore alla colecistostomia; il prosciugamento non è necessario; la colecistectomia nella presenza della itterizia è adesso un'operazione sicura purchè si diano Vitamine K ed i sali di bile prima e dopo l'operazione. L'operazione deve essere fatta in giu. Il canale commune si deve esaminare a fondo se è dilatato, o se una storia precedente di itterizia si è ottenuta, e se si trovanocalcoli biliari. Il vaso conduttore T è un' aggiunto necessario nella chirurgia del canale commune. L'anestesia spinale e il più sicuro di tutti gli anestetici nella chirurgia dell'addome superiore.

The Committee on Scientific Research of the American Medical Association has awarded a grant to **Dr. Charles O. Warren, Jr.,** instructor in physiology at Cornell University Medical College, for the continuation of studies on the metabolisms of bone marrow. The Committee has also renewed the grant of last year to **Dr. Joseph H. Roe,** professor of biochemistry in the School of Medicine of the George Washington University, in support of the continuance of his work on methods for the determination of ascorbic acid and of a study of the effect of vitamin C upon gastric function.

Dr. W. H. Taliaferro of the University of Chicago delivered the fourth Charles Franklin Craig lecture on tropical medicine at the thirty-fifth annual meeting of the American Society of Tropical Medicine held in Memphis, Tenn., from November 21 to 24. "The Mechanism of Acquired Immunity to Metazoal Parasites" was the subject of Dr. Taliaferro's lecture. **Dr. Richard P. Strong** presented the Walter Reed Medal to **Dr. William B. Castle,** of Harvard University. **Dr. Alfred C. Reed** delivered his presidential address on "The Future of Tropical Medicine" at the annual luncheon on November 23. A joint session was held November 23 with the National Malaria Committee.

NATIONAL ASSEMBLY

THE NATIONAL ASSEMBLY OF THE UNITED STATES CHAPTER OF THE INTERNATIONAL COLLEGE OF SURGEONS WILL BE HELD ON FEB. 11 TO 14, 1940, AT VENICE, FLORIDA, UNDER THE DIRECTION OF DR. FRED H. ALBEE, INTERNATIONAL PRESIDENT-ELECT, AND THE PRESIDENCY OF DR. FREDERICK M. DOUGLASS, PRESIDENT OF THE UNITED STATES CHAPTER AND CHAIRMAN OF THE PROGRAM COMMITTEE.

ACUTE CHOLECYSTITIS

JAMES McKENTY, M.D., F.R.C.S. (Canada), F.A.C.S.

WINNIPEG, CANADA

SURGICAL literature during the past ten years has been crowded with articles on acute cholecystitis. These articles show that there is a wide diversity of opinion concerning treatment. Nearly all practitioners agree that in about ninety per cent of cases, an operation for removal of the gall sac will sooner or later become necessary for complete cure. When the operation should be performed is the point in dispute.

The old practitioners will be reminded of a similar controversy during the last decade of the nineteenth century on the question whether early operation or interval operation yielded the better results in acute appendicitis.

In 1895, Sahli,[1] then chief of the Medical Clinic at Berne, Switzerland, published the result of his investigation into the mortality of the medical treatment of acute appendicitis. In that report, he wrote: "I received replies from a total of 466 physicians. The material covered by the answers consists of 7,213 cases of perityphlitis; 6,740 treated by non-operative measures yielded 591 fatalities — 8.8 mortality." Inasmuch as several surgeons in Europe and on this Continent reported, before the end of the nineteenth century, a mortality of three per cent or less for early operation, Sahli, by establishing the mortality of medical treatment, contributed greatly to the solution of the problem of acute appendicitis.

MORTALITY

The mortality of acute cholecystitis, under medical treatment, is not given in any modern textbook on either medicine or surgery; it is, therefore, evidently unknown. Recent literature has presented some data which I have collected in Table I, which shows a mortality of 35 in 645 cases (5.4 per cent); this is too small a number to justify a conclusion.

TABLE 1

MORTALITY UNDER MEDICAL TREATMENT

	Total	*Improved*	*Unchanged*	*Worse*	*Died*
McNeil, Love[2]	69	60	0	9	0
M. M. Zenninger[3]	54	20	19	15	0
S. H. Mentzer	63	0	0	0	14
G. H. Pratt	45	0	45	0	0
M. K. Smith[4]	94	0	0	0	0
Nils Liedberg[5]	244	192	0	0	19
Local Hospitals	76	69	5	0	2
	645	341	69	24	35

128 in which medical treatment failed

It should be noted that 69 were unimproved, and 24 became worse, totalling 128, about 20 per cent in which medical treatment failed. We know that about 60 per cent of those relieved by medical treatment have recurrent attacks, which means failure to cure by medical treatment.

TABLE 2

THE MORTALITY OF OPERATION WITHIN 48 HOURS OF ONSET

	Cases	*Deaths*
H. F. Graham	164	6
M. M. Zenninger	12	0
G. H. Pratt	23	0
G. J. Heuer	112	2
Kunath	6	0
Author	16	0
	333	8
Graham & Hoefle[6]	51	2
	384	10 (2.6%)

Surgery has not yet justified its intervention. A study of the literature shows a ten per cent mortality for the average clinic and time required for doing the required cholecystectomy. The time from the tenth to the twentieth day after onset has the highest mortality for a cholecystectomy. Table 2 reports 384 cases which were operated upon within 48 hours of onset with a mortality of only 2.6 per cent.

PATHOLOGY

The study of the pathology disclosed by operation upon the living has done so much to clarify our understanding of intra-abdominal disease that the operative findings and the gross appearances in my 76 cases may be worth presenting. A study of the specimens has led me to classify them into two groups, namely: (1) the uncomplicated, of which there were 37; and (2) the complicated, of which there were 39.

1. *Uncomplicated Cases.* Laparotomy reveals a gall sac about twice the normal size, of purplish pink color; the peritoneal covering still retains its luster. It is tensely distended, often covered by a few frail omental adhesions. Its contents are slightly bile stained, seromucous, often slightly purulent. In 35 of the 37, the cystic duct was obstructed by a large stone impacted in Hartmann's pouch or a smaller stone impacted in the mouth of the duct. In the majority, a large stone was the cause of the obstruction. The gross specimen shows walls from 0.5 to 1 cm. in thickness, more like an edema than an inflammatory swelling. The mucosa sometimes shows necrotic patches, is soft, and is easily rubbed off from the underlying fibrous coat. The operative findings in this group are found in operations done early, rarely after the first week.

What can the healing power of Nature do with such gall bladders? Stones are present in more than 90 per cent. The best that natural power can do is to leave a fibrous sac containing stones. Recurrent attacks are the most frequent sequel of relief from medical treatment.

2. *Complicated Cases.* There were 39 in this group. Stones were present in 37. A perforation was found in 7 with extravasation of pus and stones into a pocket. These pericholecystic abscesses were effectively circumscribed; as bile no longer enters such a gall bladder, the danger of infection spreading from such an abscess is extremely slight. Gangrenous areas are found in 25 per cent of these gall sacs. In these cases, the gall sac is covered by dense adhesions, making the operation for its removal much more difficult than in group one. This is the type of morbid anatomy found after the first week and is plainly incurable by *vis medicatrix naturae.* Fistula into the duodenum or colon is not uncommon. Removal of the gall bladder is essential for cure. Without removal, an empyema of the gall sac is the best result that can be expected. This, along with the dense adhesions impairing the functions of the stomach, leaves the patient with a persistent intractable dyspepsia.

TREATMENT

The favorable experience with partial resection of the gall sac leads me to regard it as the operation of choice in all acute cases in which anything more than simple drainage is considered safe. The technic I have followed is as follows.

The tensely distended sac is emptied by aspiration, opened, the stones removed, and its cavity swabbed out with iodine. An iodine pack is left in the sac, while the cystic duct and artery are exposed and tied. The sac is then excised, either from above downward or from below upward, leaving the portion attached to the liver undisturbed. From this portion the softened mucosa is easily removed by rubbing with gauze, preferably saturated with iodine. In these acute cases the gall sac is easily pulled off its bed in the liver by traction, and so too much force by the assistant in elevating the gall sac must be avoided. In one case in which the

sac was completely pulled off a very stormy convalescence resulted. The complete removal of the gall sac leaves a denuded raw surface on the liver which, I believe, adds greatly to the danger of toxemia, and to what has been called "liver death."

TABLE 3

CASES OPERATED UPON BY THE AUTHOR

No.	*Operation*	*Deaths*
18	Cholecystostomy	0
31	Partial cholecystectomy	1
27	Complete cholecystectomy	4

All cases of acute cholecystitis excepting those complicating typhoid fever begin as a gall bladder colic. About 90 per cent of such cases of colic subside before advancing to the inflammatory state of cholecystitis.

All colics persisting longer than 24 hours without improvement should be regarded as having an inflammatory basis. Therefore, I urge that the general practitioner should send such a patient into a hospital not later than 48 hours after onset. This is in accordance with Graham and Hoefle's[6] advice, and agrees with their advocacy of the education of the general practitioner on such matters. Ten years were required for such education in the matter of appendicitis forty years ago.

Table 2 shows a mortality in 384 cases operated upon within 48 hours of 2.6 per cent.

A study of the literature of reports of several thousands of cases shows that the delayed plan of treatment yields a mortality of 10 per cent.

SUMMARY

(1) My discussion of this matter leads to the conclusion that more information is required, especially regarding the medical treatment. The data here presented shows that medical treatment fails in about 20 per cent of all cases.

(2) The morbid anatomy disclosed by operation in my 76 cases strongly supports the view that such cases are not curable by medical treatment.

(3) Partial cholecystectomy was done in 31 of my 76 cases with one fatality.

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RÉSUMÉ

Cholécystite aiguë

Nos connaissances de la cholécystite aiguë sont insuffisantes. Le traitement médical échoue dans vingt pour cent de tous les cas.

L'auteur a examiné les pièces anatomiques dans soixante-seize cas qu'il a opérés. Il décrit sa technique opératoire. Il est convaincu que le traitement médical ne guérit la cholécystite aiguë.

Dans trente-et-un des 76 cas, il pratiqua une cholécystectomie partielle. Il n'eut aucun décès.

ZUSAMMENFASSUNG

Akute Gallenblasenentzündung

1. Der Verfasser kommt zu dem Schluss, dass mehr Information über die akute Gallenblasenentzündung nötig ist, besonders in Hinblick auf die medizinische Behandlung. Die angeführte Statistik zeigt, dass die medizinische Behandlung in ungefähr 20% aller Fälle nicht zum Ziele führt.

2. Die anatomischen Verhältnisse, die bei den 76 vom Verfasser vorgenommenen Operationen, vorgefunden wurden, bestärken nachdrücklich die Ansicht, dass diese Fälle durch medizinische Behandlung nicht geheilt werden können.

Die Operationstechnik wird ebenfalls beschrieben.

3. Partielle Cholecystekomie wurde in 31 der 76 Fälle vorgenommen, wobei 1 Todesfall eintrat.

SUMARIO

Colecistitis aguda

(1) El autor concluye que mas información con respecto a colecistitis aguda es requerida, especialmente con respecto al tratamiento médico. Los datos presentados aquí muestran que el tratamiento médico fracasa en el 20% de todos los casos.

(2) La anatomía mórvida muestra que operando en los 76 casos del autor, la tecnica por la cual es decrita, fuertemente soporta la creencia que tales casos no son curables por tratamiento médico.

(3) Colecistectomia parcial fué hecha en 31 de sus 76 casos, con una fatalidad.

RIASSUNTO

Colcsistite Acuta

(1) L'autore conclude che bisogna avere più informazione in quanto a colesistite acuta, specialmente riguardante la cura medicinale. La data qui' presentata mostra che la cura medicinale non riesce in circa venti per cento di tutti i casi.

(2) L'anatomia morbosa rivelata dall'operazione nei settantasei casi dell'autore, il tecnico pel quale è descritto, appoggia fortemente l'idea che tali casi non sono curabili per cura medicinale.

(3) Colesistettomia parziale fu fatto in trentuno dei suoi settantasei casi, con una fatalità.

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CLINICAL ORTHOPEDIC SOCIETY

Dr. H. Earle Conwell, of Birmingham, Ala., was elected president of the Clinical Orthopedic Society at the annual meeting of the society held October 13 and 14 at Oklahoma City, Okla., and Little Rock, Ark.

Dr. C. A. Stone, of St. Louis, was chosen vice-president and **Dr. M. O. Henry,** of Minneapolis, secretary-treasurer.

A clinical program was given in both cities under the supervision of the Oklahoma Clinical Orthopedic Society and the Arkansas Medical School.

The association, the largest of its type, is unique in that its work is entirely clinical.

MILWAUKEE SOCIETY OF CLINICAL SURGERY

A symposium on biliary surgery was held at the meeting of the Milwaukee Society of Clinical Surgery on November 28 at the University Club of Milwaukee.

Dinner, served at 6:30, was followed by the scientific program. **Dr. Armand J. Quick,** associate professor in the department of pharmacology, Marquette University School of Medicine, spoke on "Consideration of Prothrombin and Vitamin K in Surgery;" **Dr. W. J. Carson,** on "Surgery of the Biliary Tract;" and **Dr. Max Bornstein** discussed both papers.

Dr. Karl Schlaepfer is president and Dr. Edward O. Gertenbach is secretary of the Society.

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FELLOWSHIP DUES, AS WELL AS DUES FOR MEMBERSHIP AND ASSOCIATE MEMBERSHIP, ARE PAYABLE NOW AND SHOULD BE SENT TO DR. BENJAMIN I. GOLDEN, DAVIS MEMORIAL HOSPITAL, ELKINS, W. VA.

SIMPLIFIED APPLICATOR FOR LOCALIZATION OF THE ANGLE OF THE NECK AND SHAFT OF THE FEMUR

AND A DIRECTOR FOR GUIDANCE TO INTERNAL FIXATION

BENJ. I. GOLDEN, M.D., F.A.C.S., F.I.C.S.

From the Surgical Service, Golden Clinic

ELKINS, WEST VIRGINIA

ALL methods so far reviewed by the author for obtaining an accurate alignment for internal fixation of the fractured neck of the femur have depended on either direct application to the shaft of the femur or mathematical deductions from roentgenograms. The direct method involves time and the introduction of extra mechanical appliances into the wound. Since time is a definite factor in all surgery of the aged, and most fractured femurs fall in this group, every effort should be made to reduce it to a minimum. In bone surgery the least amount of trauma and manipulation predisposes to better results and minimizes the possibility of infection.

DESCRIPTION

The director herein described is easily applied, does not depend upon personal interpretation, and is fixed to the operating table, thus eliminating the possibility of slipping, failure to start from the proper fixed point, or mathematical calculation. It is attached to the table by means of a piece of strap iron bent to form a right angle. This upright arm is fixed near the crest of the ileum. It does not interfere with the flexion of the thigh and thus permits the Dooley method of lateral x-raying. The U shaped arm is fastened to the angle portion of the fixed upright. It is then parallel to the leg and directly over the head and shaft of the femur.

USE

With the position of the heel marked so that it can always be replaced at the exact point, the foot is adducted twenty degrees. With the aid of an x-ray film, one can determine the correct angle for fixation by counting the correct number of holes on the internal limb of the director to the center of the head. The same procedure will give the correct hole on the lateral limb, to a point about one inch below the greater tuberosity. By placing the directional bar over the holes and fixing it, the corrected line of the angle of the neck on the shaft is definitely fixed. This film is exposed and developed while drapes are being placed and the incision made. Should it be desired, an inverted U channel can be attached which will permit the nail to be driven accurately through a fixed groove. If a motor drill is used for bone pegging, the U channel is left off and the angle maintained by keeping the fixed arm and drill in line by downward sighting.

The complete Director may be sterilized, and with the exception of an attachment to the operating table, it remains sterile without interfering with drapes or operative procedure. Should lateral films be desired, the parallel portion can be rapidly removed, the leg flexed and the picture taken. By returning the heel to the predetermined spot, correcting the internal angle of the foot, and replacing the parallel arm of the Di-

* Note: This Director has been approved by Dr. Fred H. Albee as an accessory on his new orthopedic table.

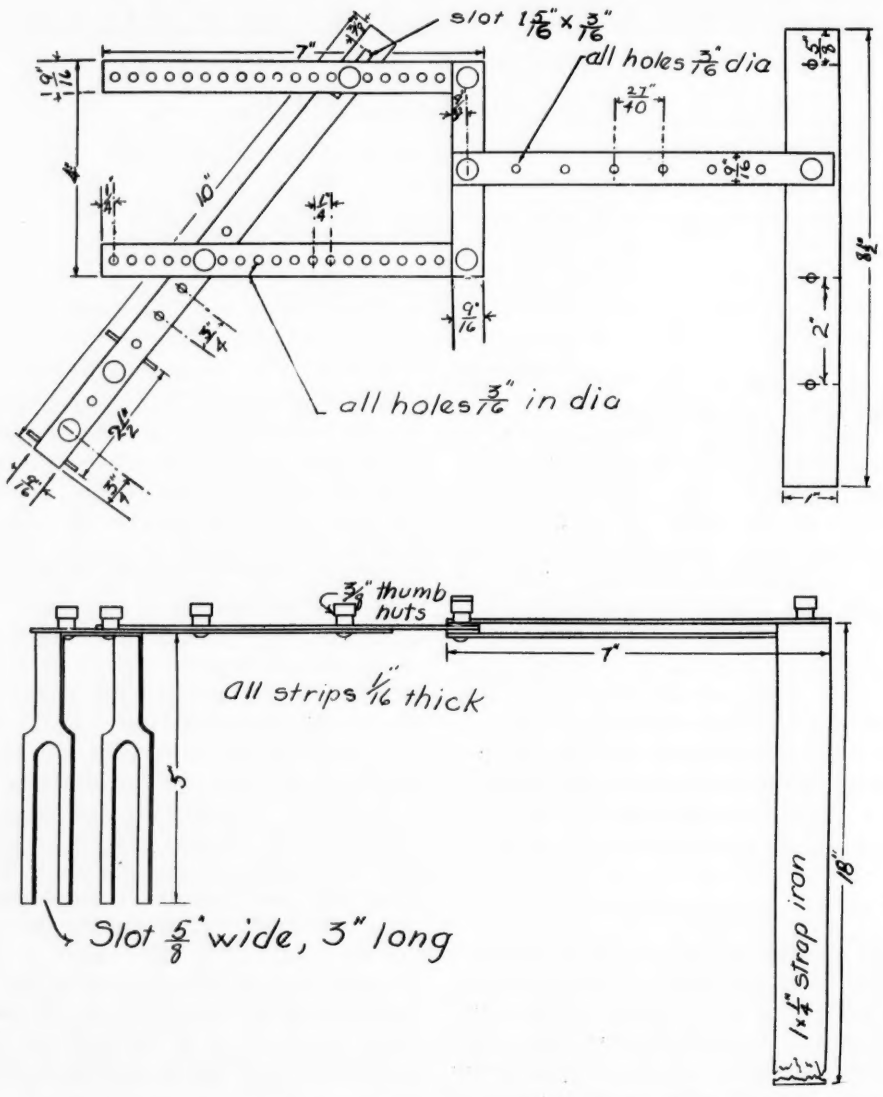

Fig. 1. Schematic drawings of Director. Above, U shaped arm, with all parts assembled. Below, lateral view showing inverted U Director.

rector, one again finds all measurements to be correct without the necessity of checking with x-rays. Since the parallel arms of the Director are four inches apart, the length of the nail, pins or bone peg can be determined, correct allowance being made for x-ray distortion. All these factors are established and fixed beforehand. Thus if the roentgenologist will fasten the upright arm to the bare operating table, place the parallel bars in position and take a film, he can determine the amount of distortion between the parallel arms and the film, provided the height of the upright is known. This height will remain fixed

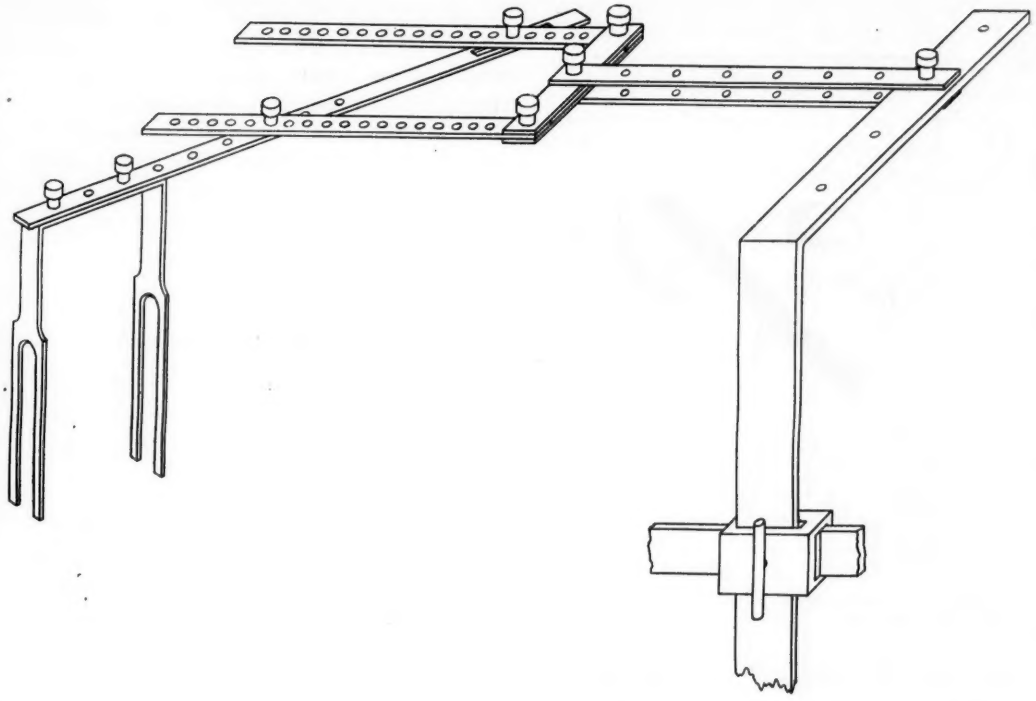

Fig. 2. Semi-lateral view of Director, with all parts in position.

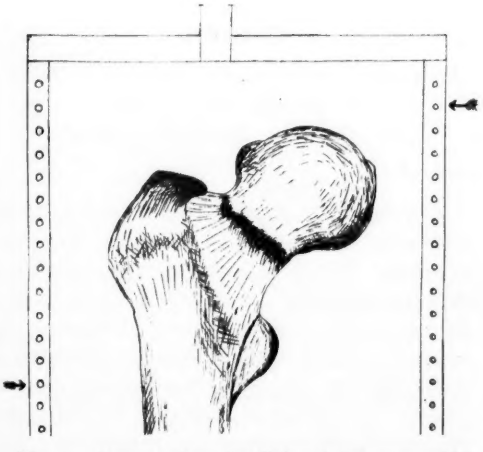

Fig. 3. Arrows show localizing holes over which Director is fastened. The parallel limbs are wider than actual to enable one to visualize the procedure.

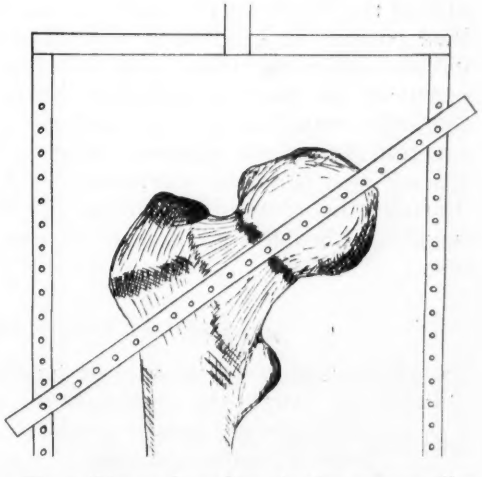

Fig. 4. Director in position showing accurate alignment for fixation splint.

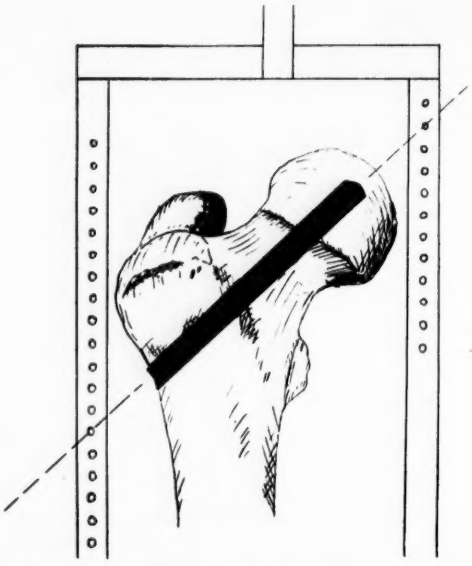

Fig. 5. Fixation splint in position. Director limb has been removed.

for all future pictures if the parallel bars are always placed at the same distance from the table top.

SUMMARY

Herewith is presented a Director for establishing correctly the angle of the neck of the femur on the shaft. It has a fixed position in relation to the patient and the operating table. The accurate length of the fixation appliance can be definitely established. Its application and function do not increase trauma or depend upon personal interpretation. It shortens the time of operation. It is equally applicable for all types of fixation.

RÉSUMÉ

Un applicateur simplifié pour la localisation de l'angle du fémur, et un directeur servant comme guide pour la fixation interne

L'auteur présente un directeur indiquant l'angle du col du fémur sur la diaphyse. Le directeur a une position fixe par rapport au malade et à la table d'opération. Son emploi diminue la durée de l'operation et est applicable à tous les types de fixation. Sa longueur exacte peut être réglée. Son application et son fonctionnement n'augmente pas le traumatisme et ne dépend pas de l'interprétation personnelle.

ZUSAMMENFASSUNG

Vereinfachter Apparat zur Auffindung des Oberschenkelwinkels und eine Anleitung zur Führung der internen Fixation

Der Verfasser gibt eine Anleitung zur genauen Bestimmung des Winkels, den der Oberschenkelhals mit dem Schaft bildet. Das Instrument ist in einer fixierten Stellung zum Patienten und Operationstisch. Es verkürzt die Operationszeit und kann bei allen Fixationsmethoden angewendet werden. Seine genaue Länge kann ganz exakt eingestellt werden. Seine Anwendung und Funktion beruhen nicht auf persönlicher Auslegung und vermehren nicht die Gefahr des Traumas.

SUMARIO

Aplicador simplificado para la localización del angulo del femur, y un director para guiar la fijación interna

Un director para establecer el angulo correcto del cuello del femur es presentado. El director tiene una posición fija en relación á el enfermo y la mesa de operación. Este acorta el tiempo de la operación y es igualmente aplicable á todo tipo de fijación. Su medida exacta puede ser defenitivamente establecida. Su aplicación y funcionamiento no aumenta el trauma ó depende de interpretación personal.

RIASSUNTO

Applicatore semplificato per localizzazione della caviglia del Femore, e un istrumento chirurgico per la guida alla fissazione internale

Un direttore per stabilire correttamente l'angolo del broncocele del femore sopra il susto è presentato. Il direttore ha una posizione fissa in relazione al paziente e alla tavola d'operazione. Diminuisce il tempo dell'operazione ed è ugualmente applicabile a tutte specie di fissazione chirurgica. La sua lunghezza precisa può stabilírsi definitamente. La sua applicazione e funzione non aumentano traumatismo nè dipende da interpretazione personale.

NEW MEMBERS OF MEXICAN CHAPTER

The following were received as members of the Mexican Chapter of the International College of Surgeons in the Chapter's session held December 1: **Dr. Antonio Cornillon,** director of Hospital Francés, Mexico City, and a member of the National Academy of Medicine; **Dr. Manuel F. Madrazo,** member of the Mexican Academy of Surgery and of the National Academy of Medicine; **Dr. Alejandro Cerisola,** member of the Mexican Academy of Surgery; **Dr. Aquilino Villanueva,** director of the National General Hospital, Mexico City, and a member of the Mexican Academy of Surgery and of the National Academy of Medicine; **Dr. Estaban Paulín,** director of the Civil Hospital and member of the Mexican Academy of Surgery, Queretaro City; and **Dr. Rafael Macías Peña,** director of the Civil Hospital and a member of the Mexican Academy of Surgery, Aguascalientes City. All except the last two are from Mexico City.

Dr. Gonzalo Casteñada, F.I.C.S., of Mexico City has been made chief of the gynecology service of the Spanish Hospital, Mexico City.

Dr. Aquilino Villanueva, F.I.C.S., of Mexico City, was elected president of the Board of Directors of Mexican Academy of Surgery for 1940-1942 at a meeting held November 23.

The fourth International Congress of Neurology will be held in Paris in 1942 or 1943, if plans made at the third Congress held in Copenhagen August 21-25, 1939, are carried out. The third Congress was attended by about 500 neurologists from all countries.

INTERNATIONAL OFFICERS

President, Dr. André Crotti, Columbus, Ohio.

President-Elect, Dr. Fred H. Albee, New York City.

Vice-Presidents, Prof. Dr. Rudolf Nissen, Istanbul, Turkey; Prof. Dr. A. Mario Dogliotti, Catania, Italy; Prof. Dr. Alexander Stanischeff, Sofia, Bulgaria.

Treasurer, Dr. William Seaman Bainbridge, New York City.

Acting International Secretary, Dr. Max Thorek, Chicago.

A BONE STRUT FOR PARALYTIC FOOT DROP

L. D. SMITH, M.D., F.A.C.S.

Clinical Instructor, Department of Orthopedic Surgery of Marquette University, School of Medicine

MILWAUKEE

IN cases in which it is desired to limit plantar flexion of the foot, otherwise retaining full motion of the ankle joint, the following method is offered.

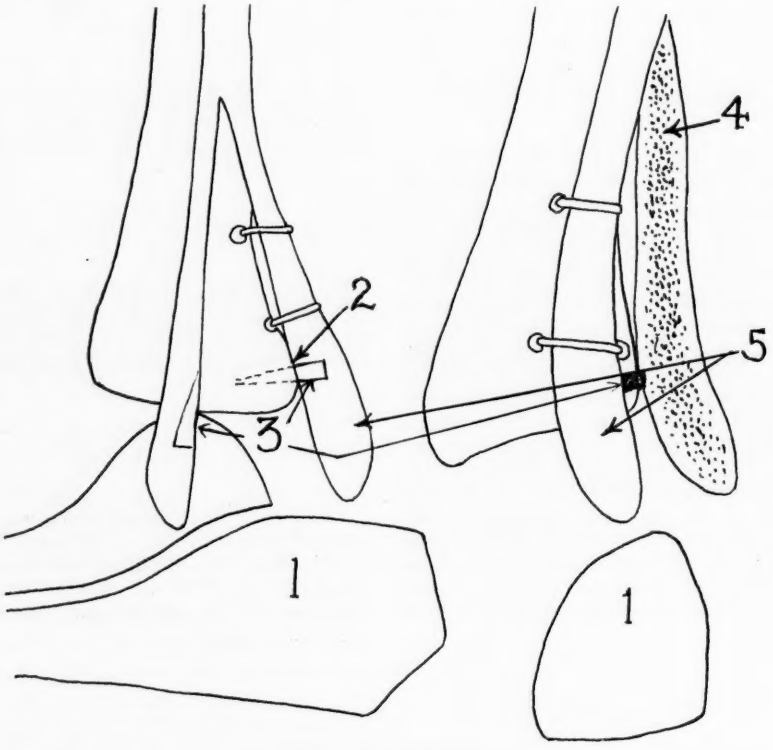

Fig. 1. Lateral (left) and posterior (right) views of fibula, which normally projects one-half to three-fourths inches below the tibia and seems to be especially fashioned to lend a buffer strut for the dorsal surface of the os calcis to impinge against. *1,* Os calcis; *2,* freshened tibial surface; *3,* bone plug; *4,* anterior half of fibula, which remains intact and retains the ankle mortise undisturbed; *5,* posterior half of fibula greensticked over to freshened surface of tibia (with which it unites) to act as a bone prop against os calcis, fibular fragment carrying peroneal tendons with it.

TECHNIC

A vertical incision, 4 to 6 inches long, is made over the fibula, extending upward from a point one-half inch distal to the external malleolus. The distal third of the fibula is exhibited.

The fibula is sawed in a frontal plane and bisected fore and aft and upward about 4 to 6 inches. The posterior half is carried medially and posteriorly, with the peroneal tendons, to lie on the freshened posterior surface of the tibia.

* Read before the American Academy of Orthopedic Surgery, January 15, 1939, at Memphis, Tenn.

The displaced posterior half of the fibula, still undisturbed in its continuous and intact upper end, grows fast to the tibia.

The fibula normally projects one-half to three-fourths of an inch below the tibia and each other and to the tibia. The posterior fibular fragment will unite with the freshened surface of the tibia, upon which it then rests. The space between

Fig. 2. Roentgenogram of distal portion of tibia and fibula of Mr. H. W., aged 61, taken 5½ months postoperatively. Bone block was performed January 17, 1938; film was taken July 1, 1938.

seems to be especially fashioned to lend a buffer strut for the dorsal surface of the os calcis to impinge against. The peroneal tendons act as a cushion between the strut and the os calcis.

The displaced posterior half of the fibula can be retained in place either by chromic ties threaded through holes in the tibia or, preferably, by a bone peg.

The bone peg is the most easily placed and positive temporary fixation is carried out to retain the displaced fibular fragment. The bone peg can be taken from either of the fibular fragments as shown, Fig. 1.

COMMENT

The fibular fragments effect a bony consolidation in their new relationship to the fibular fragments will eventually be bridged across with new bone.

A plaster boot extending from the toes to the knee is applied so that it holds the foot in neutral position.

Under normal conditions the patient may be permitted to get about on crutches within ten days. Guarded weight bearing may be begun with the use of crutches within three weeks. The cast may be removed in five weeks. Full weight bearing without crutches may be resumed in eight to ten weeks.

This method has been used success-

fully by me in ten cases, eleven ankles being involved.

This method offers simplicity of operative approach, utilization of bone

TABLE I

RESULTS OBTAINED

Name	*Date of Operation*	*Age*	*Side Affected*		*Polio-myelitis*	*Childbirth peroneal nerve injury within the pelvis*	*Fractured hip cast pressure on peroneal nerve at the knee*	*Uncomplicated fusion of the displaced fibular fragment in its new position*
			Rt.	*Lt.*				
Micheal V.	10- 2-35	7		X	X			X
Herman W.	1-17-38	61	X				X	X
Eleanor G.	7-25-38	32	X			X		X
Anthony G.	9-28-38	18	X	X	X			X
Florence B.	1-23-39	34	X		X			X
Lorraine B.	6- 5-39	9		X	X			X
Kathryn K.	7-10-39	28		X	X			X
Marie T.	7-17-39	35		X	X			X
Catherine	7-25-39	9	X		X			X
Emil D.	8-16-39	15		X	X			X

In each instance the convalescence conformed to the above program. The fibular fragments became firmly consolidated in their new relationship. Upward tilting of the os calcis beyond a horizontal position is automatically prevented by the strut function of the displaced fibular fragment.

One objection which might be raised against the former method of treating paralytic foot drop is that it erects upon the os calcis a pyramid of bone which, growing rigidly to the movable os calcis, must move with every movement of the os calcis. It seems to me that this movement might be a cause of irritation which would prevent a perfectly healthful condition from existing at the point of irritation. Even if the irritation produced no critical condition, the existence of a bone oscillating within a fleshly envelope is not a perfectly desirable condition.

Mechanically the strut is a very efficient device for resisting motion or force in its line of direction. The displaced fibular fragment is the strut which provides the resistance against upward motion of the os calcis. The peroneal tendons act as a cushion between the fibular fragment and the os calcis.

available in the one operative field and utilization of the mechanical principle of a strut in absorbing a force along its axis.

SUMMARY

The author's technic for open operation to limit plantar flexion of the foot, with retention of full motion of the ankle joint, is described. Results obtained in 10 cases are presented in tabular form.

RÉSUMÉ

Un support osseux pour chute de pied paralytique

La technique de l'auteur pour son opération limitant la flexion du pied tout en conservant tous les mouvements de l'articulation tibio-tarsienne est décrit en détail. L'auteur tabule les resultats obtenus dans dix cas.

ZUSAMMENFASSUNG

Operation zur Verbesserung des Ganges beim paralytisch gelähmten Fuss

Der Verfasser beschreibt seine Technik für die offene Operation zur Begrenzung der plantar Flexion bei Erhaltung

der Beweglichkeit im Knochengelenk. Die Resultate von 10 Fällen werden in Tabellen-Form dargestellt.

SUMARIO

Una cuña de hueso para la caida paralítica del pie

La tecnica del autor de la operación abierta para limitar la flexión del pie con la retención de la moción completa de la articulación del tobillo es descrita. Los resultados obtenidos en 10 casos son presentados en forma tabular.

RIASSUNTO

Un Puntello di osso per caduta di piede paralitico

La tecnica dell'autore per operazione aperta per limitare la flessione della pianta del piede con retenzione di completo movimento della guintura della caviglia è descritta. I risultati ottenuti in 10 casi sono presentati in forma tavolare.

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Drs. Chevalier Jackson and Chevalier L. Jackson, professors of broncho-esophagology, Temple University School of Medicine, Philadelphia, will lecture on "The Romance of Bronchoscopy" February 29 at the New York Academy of Medicine, New York. This is one of the programs in the Fifth Series of Lectures to the Laity sponsored by the Academy and given on Thursdays at 8:15 p.m.

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Owing to the war, the British Medical Association will not hold its annual meeting in 1940, according to an announcement in the *British Medical Journal.* The meeting was to have been held in Birmingham.

—o—

The first Barnard Hospital Lecture on "Female Hormones and Genital Cancer" was given by **Dr. Edgar Allen,** of the Yale University School of Medicine, in the auditorium of the St. Louis Medical Society on October 31.

—o—

Dr. H. L. Eason, principal of the University of London, was elected president of the British General Medical Council at a meeting held November 28. He succeeds **Sir Norman Walker,** who has served since 1931.

It is reported that Germany has closed all but four of her universities; those remaining open are Berlin, Vienna, Munich and Jena.

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Science Progress, issued quarterly and now in its thirty-fourth volume, has suspended publication because of war conditions.

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The faculty of medicine of the University of Bordeaux recently conferred the degree of doctor, *honoris causa,* on **Dr. Constantin Daniel,** professor of obstetrics and gynecology at the University of Bucharest.

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Dr. Viggo Christiansen, formerly professor of neurology at Copenhagen, died November 3. Dr. Christiansen was president of the Third International Neurological Congress held in Copenhagen in August.

—o—

Dr. Percy Bartlett has retired from the faculty of the Medical School of Dartmouth College with the title of professor emeritus of surgery. He has been a member of the faculty for 35 years.

LUDWIG'S ANGINA: REVIEW OF 21 CASES

RICHARD A. LEONARDO, M.D., Ch.M., F.I.C.S.

ROCHESTER, NEW YORK

THE recent occurrence of two cases of Ludwig's angina in the author's private surgical practice has again aroused his interest in this subject and is responsible for the following résumé of 21 cases. These patients were all operated upon in the General Hospital, Rochester. They represent the total number of cases of Ludwig's angina admitted to that institution during the last 10 years, during which time there was a total of 76,227 hospital admissions. The incidence of occurrence of Ludwig's angina therefore amounted to one case for each 3,630 hospital admissions. In view of the great rarity of this condition, it may not be amiss to describe briefly the clinical course of an average case before continuing with this analytical study.

CLINICAL COURSE

The clinical course of an average case is as follows: First there is swelling of the gums about a careous tooth (usually a lower molar); then chills and fever (99° to 105° F.) appear, with localized swelling of the floor of the mouth, followed by swelling of the submaxillary area that is hard and tender but nonfluctuating. In fact, due to the tense mylohyoid diaphragm, fluctuation never occurs except in terminal stages of the disease; and usually, in early Ludwig's angina suppuration is not present anywhere; there is only cellulitis and inflammatory edema. The patient has difficulty in opening his mouth and has difficulty in breathing, talking and swallowing.

The report of this affection by Professor Ludwig of Stuttgart, in Württemberg (1836), as a gangrenous induration of the neck aroused considerable local interest since Queen Catherine of Württemberg had died from the disease. It was named Ludwig's angina by Camerer the following year and since then almost any serious or fatal infection arising in the mouth, neck or pharynx has been called by this name. Strictly speaking, however, this is incorrect.

True Ludwig's angina is present when there is marked edema and swelling of the floor of the mouth that pushes the tongue upward and backward, causing respiratory embarrassment and difficulties in speech and in deglutition, associated with a "woody" or brawny induration and swelling of one or both submaxillary regions or the submental region. Usually the infection begins around careous teeth and promptly spreads to the floor of the mouth, causing cellulitis and inflammatory edema with elevation of the tongue. The infection invades the submaxillary region (and occasionally the submental region) via the fascial planes, traveling around the posterior border of the mylohyoid muscle in the region of the submaxillary salivary gland. Occasionally the infection arises in the submaxillary region and ascends into the floor of the mouth, again spreading around the posterior border of the mylohyoid muscle. It may remain localized to one side, or spread to the midline and then to the other submaxillary region, but in all cases the area of cellulitis is deep to the diaphragm of the mylohyoid muscles. The infection may be partly above and partly below the geniohyoid muscles, but it is never superficial to the mylohyoids, and this, of course, is of great surgical

importance. It means that efficient drainage will not take place until this mylohyoid diaphragm has been *completely* incised.

The local surgical anatomy is of great importance because it has been shown that the high mortality in the past was due to lack of appreciation of the significance of this mylohyoid diaphragm; hence the surgeon's insufficient opening of this diaphragm failed to result in adequate drainage, so that the cellulitis and edema extended frequently to the larynx, mediastinum and lungs. Death from edema of the glottis, therefore, frequently occurred; a life-saving tracheotomy was performed on many other patients. More rarely, secondary hemorrhage is the cause of death, as occurred in the only fatal case of our series.

TREATMENT

Since the causative organism is frequently either the streptococcus or the pneumococcus, sulfanilamide therapy, postoperatively, may be of benefit, but preoperatively, I would not advise its use. For simple infections of the mouth and the area around the teeth, sulfanilamide is often of great value, but once a bona fide Ludwig's angina has developed, immediate and adequate surgery is demanded; once distinct edema and swelling of the floor of the mouth (with consequent elevation of tongue) are present, all temporizing measures should be thrown to the winds and the surgeon should make sure that he *widely* incises the mylohyoid. If this is done promptly and adequately before the condition becomes bilateral, such a complication (extension to the other side) will be prevented in a large percentage of cases. But if both sides are already involved before operation, wide incisions bilaterally, through the entire length of the mylohyoid muscle, will almost always release the pressure in the patient's throat and induce prompt recovery.

DIAGNOSIS

In considering the differential diagnosis, therefore, it becomes obvious that a simple submental or submaxillary swelling does not constitute true Ludwig's angina. This latter condition may subsequently develop from such a swelling if the infection spreads around the posterior border of the mylohyoid muscle (in the region of the submaxillary salivary gland) to invade the floor of the mouth, causing inflammatory edema (with or without actual pus formation there), with consequent elevation of the tongue. Such patients invariably develop respiratory and deglutition difficulties. I would say, therefore, that when definite edema of the floor of the mouth is present, the patient has a true Ludwig's angina (irrespective of its cause) and that this is a condition which cannot be easily confused with any other malady.

ANALYSIS OF CASES

Continuing our analytical study of the above mentioned 21 cases, we find as follows:

Sex. Eight cases occurred in males; thirteen in females.

Age. This varied from 19½ months (female infant) to 70 years (syphilitic female who died from other causes). The average age was 32 years.

Etiology. Dental caries was the original cause in four males and seven females. A fractured jaw bone was the original cause in one female (auto accident) and in one male (blow on the jaw received from fighting); cervical adenitis, of two cases, one in a male and one in a female.

Dentures and bridge work were responsible for two cases, one in a woman in whom the partial plate irritated the gum around a healthy tooth and started an infection which later spread to the floor of the mouth, the other case in a man, aged 64, in whom one week prior to admission to the hospital a piece of jaw bone had been chipped off while eating

hard food with dentures which did not fit properly. In one case the infection started after amputation of the lower extremity through the mid thigh for gangrene due to Burger's disease. The etiology is obscure in this case, although the patient was moribund for several days prior to the development of angina, and she may have suffered some sort of injury to the floor of her mouth at that time. The three remaining cases were due to miscellaneous causes. In one man the etiology was sore throat of four days' duration. In one of the two remaining cases (both females) removal of some small tumours below the chin was the responsible factor (due to secondary infection). The other case was that of a woman 70 years old with syphilis, who, during one of her convulsions, badly bit the tip of her tongue, causing the development of infection and gangrene which soon spread to the floor of the mouth, thus producing a true Ludwig's angina.

Operative Procedure. This résumé was purposely restricted to the last 10 years because it is only during that period of time that the surgical treatment of Ludwig's angina at the Rochester General Hospital has been more or less standardized to one of three incisions.

TECHNIC. If the infection is unilateral, the the incision is made on that side about one finger's breadth below and parallel with the ramus of the mandible. This incision extends completely through the mylohyoid muscle, which forms the diaphragm for the floor of the mouth. The posterior margin of the incision begins at the site of the submaxillary salivary gland, which is to be avoided carefully and retracted laterally, if necessary. The incision then extends forward parallel with the jaw almost to the midline, the mylohyoid muscle being completely incised so that it is slit open widely. The surgeon's finger is then inserted into the floor of the mouth and the spaces opened; this blunt dissection is persisted in until the operator's finger reaches the oral mucus membrane.

If the condition is bilateral, a similar procedure is carried out on the other side, care being taken also to avoid the facial artery and vein.

A résumé of these 21 cases shows that the submaxillary salivary gland was not damaged in any case, and that the facial artery and vein were cut in only one case, ligation being necessary.

TECHNIC. The third standardized incision which we use in treating Ludwig's angina is serviceable primarily in cases in which the swelling and induration are limited to the submental region. In such a case a transverse (not a vertical) incision is made across the midline about 3 inches long, one-half of the incision being on each side of the midline. Through this incision the operator not only can widely open the mylohyoid diaphragm, which is absolutely necessary in order to permit proper drainage and subsidence of the swelling and edema, but he can also use his finger or a pair of scissors to open laterally (by blunt dissection) the tissues in the floor of the mouth until the mucous membrane is reached on either side.

Of the 21 cases enumerated above, four were bilateral (all in women) and in each of these cases bilateral incisions for drainage were performed. One case (occuring in a male) was submental and was drained through the submental incision, and the only other case treated with a submental incision was that of the 70 year old woman with syphilis who had a bilateral involvement. The remaining cases were all unilateral; two on the left side in women and four on the left side in men; and three on the right side in men and six on the right side in women (a total of 6 left and 9 right, unilateral cases). These, of course, were drained by a unilateral incision on the involved side and the wound was packed with gauze and left open, either with or without the additional use of drainage tubes.

Offending Organisms. Cultures were taken in all cases at the time of operation, whether pus was actually present or not. Hemolytic and nonhemolytic streptococci were found in nine cases in women and five cases in men. Staphylococci alone were found in two cases (one male and one female). Mixed infection was found in one case; the pneumococcus type III occurred in one case (male).

Vincent's organisms with diplococci were found in one case (female); in the two remaining cases (both female), the cultures were sterile.

Period of Hospitalization. This varied somewhat, depending on whether the patient had any other complaints, but most of the patients who recovered did so within 8 or 10 days, if not sooner. The shortest period of hospitalization was two days and the longest period was one month for a single operation. One patient had to be operated upon a second time for a recurrent Ludwig's angina two months after his first operation. Drainage had been made through a submental incision and apparently the scar that resulted from this incision interfered somewhat with proper drainage and was thus an etiological factor in the recurrence of the Ludwig's angina. This patient had infection with pneumococcus type III, which was the same offending organism responsible for the recurrence as proven by culture taken during the second operation.

End Results. Two patients died. One was the 70 year old woman with syphilis whose death was attributable to other causes, the Ludwig's angina being only a contributing cause. The second patient who died was a young girl, 21 years old, in whom the second operation on the right side was performed three days after the first because of insufficient drainage and on the following day an operation on the left side because of extension of the infection to the left side. She apparently was progressing well when she suddenly had a severe and fatal hemorrhage from the mouth, presumably from the right sublingual region. Further details are not available because autopsy was refused. All other patients did well except one man, aged 50, who was infected with pneumococcus type III and had been treated with a submental incision. As mentioned above, a second operation had to be performed on this man two months later. Still later, a third operation (plastic) was performed to remove the disfiguring scar in the submental region. Since in only one case death was due solely to the Ludwig's angina, the mortality averaged only 5 per cent. If the cases are treated adequately enough and early enough, the mortality rate will be considerably less.

COMPARISON OF RESULTS

In comparing our statistics with others formerly published, I noticed numerous differences. For instance, regarding sex, Yerger reported 23 cases (from Cook County Hospital) in which the disease occurred ten times more frequently in men than in women, whereas only 8 of our 21 cases occurred in men; he reported age limits of 7 years (youngest patient) to 56 years (oldest patient) as compared with our findings of 19½ months to 70 years; most of his reported cases were caused by careous teeth and 100 per cent had dysphagia, but only 33 per cent of these also had dyspnea. He also gave a mortality of 46 per cent for his 23 cases, compared to our mortality of only 5 per cent in 21 cases. In fact, a brief review of the literature shows a surprisingly high mortality — viz.: (1) Thomas, 1908, 40 per cent mortality in 106 cases; (2) Van Wagenen and Costello, 1928, 92 cases, 31 per cent mortality (cases compiled in the literature) whereas they also reported, at the same time, 16 cases of their own with mortality of only 12.5 per cent. However, Robertson of Chicago claims that Thomas' 40 per cent is really very low and that the actual mortality is considerably higher. In view of these statements and figures, our mortality rate of 5 per cent is surprisingly low. However, I believe that with adequate and prompt surgery the mortality will always be low and that the modern surgeon need no longer dread the outcome of any case of Ludwig's angina when he encounters such a case in his practice.

REFERENCES

Yerger, F.: Ludwig's Angina: Report of 23 Cases, Illinois M. J. 49: 168-170 (Feb.) 1926.

Leonardo, R. A.: Note on Ludwig's Angina, Ann. Surg. 86: 636, 1927.

Van Wagenen, W. P., and Costello, C. V.: Sublingual Phlegmon, Ann. Surg. 87: 684, 1928.

Grodinsky, M.: Ludwig's Angina, Surgery, 5, 678-696 (May) 1939.

SUMMARY

A total of 21 cases of Ludwig's angina was treated in the General Hospital, Rochester, New York, during the last 10 years, one case occurring for every 3,630 hospital admissions. The analysis of these cases which is herein presented indicates that the mortality (five per cent in this group) will always be low and that the surgeon need no longer dread the outcome of any case of this disease.

RÉSUMÉ

L'angina de Ludwig: revue de 21 cas

Ces cas furent soignés au General Hospital, Rochester, N. Y., durant les dix dernières années, un cas pour chaques 3,600 malades admis à l'hôpital. L'analyse de ces cas montrent que la mortalité de 5 décès dans ce groupe sera toujours peu élevé et que ces cas ne doivent pas inspirer une grande inquietude au chirurgien.

ZUSAMMENFASSUNG

Bericht von 21 Fällen von Angina Ludovici

Einundzwanzig Fälle von Angina Ludovici wurden während der letzten 10 Jahre im „General Hospital" Rochester, N. Y., behandelt. Das bedeutet, dass durchschnittlich ein Fall unter 3630 Neuaufnahmen vorkommt. Eine Analyse dieser hier veröffentlichten Fälle zeigt, dass die Mortalität, die in dieser Gruppe 5 o/o beträgt, immer niedrig sein wird und dass der Chirurg nicht mehr länger über den entgültigen Verlauf der Krankheit besorgt sein muss.

SUMARIO

Angina de Ludwig: Reseña de 21 Casos

Un total de 21 casos de angina de Ludwig fueron tratados en el Hospital General, Rochester, New York durante los ultimos 10 años, un caso por cada 3,630 enfermos admitidos. El analisis de estos casos el cual es presentado aquí indica que la mortalidad (5%) será siempre baja y que el cirujáno no tiene que temer mas los resultados en los casos de esta enfermedad.

RIASSUNTO

Angina Ludovico: Riassunto di 21 casi

Un totale di 21 casi d'Angina Ludovico fu trattato nell'Ospedale Generale, di Rochester, New York, durante i passati dieci anni, un caso occorrendo per ogni 3,630 ammissioni nell'ospedale. L'analisi di questi casi che è presentato qui indica che la mortalità (cinque per cento in questo gruppo) sarâ sempre bassa e che il chirurgo non deve più temere il risultato di alcun caso di questa malattia.

Make your hotel reservations for National Assembly (Venice, Fla.) NOW. Address Dr. W. H. Hoskins, Medical Center, Venice, Fla.

General Program of the Fifth Assembly
UNITED STATES CHAPTER INTERNATIONAL COLLEGE OF SURGEONS

(GENEVA) VENICE, FLORIDA

February 11, 12, 13 and 14, 1940

CHAIRMAN ON ARRANGEMENTS
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PROGRAM COMMITTEE
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DR. FRED H. ALBEE

HOSTESS TO ASSEMBLY
MRS. FRED H. ALBEE

SUNDAY, FEBRUARY 11

1:30 P.M.—Air Carnival, Fred Albee Airport, Venice.

4:00 to 8:00 P.M.—Registration in Main Lounge of the Florida Medical Center; inspection of exhibits. **(No registration fee)**

8:15 P.M.—Welcome by Mayor J. T. Blalock.

9:00 P.M.—Social Hour in the Patio, and Inspection of Exhibits.

8:30 P.M.—Social hour—Negro Spirituals sung by C.C.C. boys in the Sun Lounge, Florida Medical Center.

MONDAY, FEBRUARY 12

8:30 A.M.—Assembly called to order in Sun Lounge, Florida Medical Center by Dr. Fred H. Albee, General Chairman. Address of Welcome.

SCIENTIFIC SESSION

President Frederick M. Douglass,
Toledo, Ohio, presiding.

9:00 A.M.—Vaterian Pseudodiverticulum of the Duodenum.

Dr. Manuel A. Manzanilla, Faculty of Surgery, University of Mexico; Member Editorial Board; Regent from Mexico City, Mexico.

Discussion opened by Dr. Charles Edward Nagel, Great Falls, Montana.

SYMPOSIUM ON VENOM THERAPY

9:30 A.M.—Preliminary Observation of the Use of Venom in the Treatment of Spastic Paralysis.

Dr. Thomas Wheeldon, Richmond, Virginia.

Venom in the Treatment of Arthritis, Arthralgia, Neuritis and Allied Affections.

Dr. Paul Butler, Orlando, Florida.

Review of Recent Developments in Pharmacognosy in Venoms.

Eugene Maier, Ph.D., Director of Laboratories, Florida Medical Center, Venice, Florida.

Discussion opened by Dr. Wm. Seaman Bainbridge, International Treasurer, International College of Surgeons, New York City.

10:30 A.M.—Methods of Obtaining and Preparing Venom.

"Texas Jim" Mitchel, Sarasota, Florida.

11:00 A.M.—Retroperitoneal Tumors.

Dr. William Carson, Instructor of Sur-

gery, Marquette University, Milwaukee, Wisconsin.

Discussion opened by Dr. E. A. Ockuly, Toledo, Ohio.

11:30 A.M.—Surgical Treatment of Giant Cell Tumors of Bones.

Professor Alberto Inclan, Professor of Orthopedic Surgery, Habana, Cuba.

Discussion opened by Dr. Raymond W. McNealy, Professor of Surgery, Northwestern University, Chicago, Illinois.

12 M.—Recent Developments in Biliary Surgery.

Dr. Otto DeMuth, Vancouver, British Columbia.

Discussion opened by Dr. Julien C. Pate, Tampa, Florida, Senior Regent, State of Florida.

12:30 P.M.—The Management of Patients with Diffuse Peritonitis.

Dr. Thew Wright, Professor of Surgery at University of Buffalo School of Medicine, Buffalo, New York.

Discussion opened by Dr. Harry H. Everett, Lincoln, Nebraska, Attending Surgeon, Lincoln General Hospital, Bryan Memorial and St. Elizabeth Hospitals.

1:00 P.M.—Luncheon.

1:30 to 2:30 P.M.—Round Table: Guild Functions.

Dr. Charles Arnold, Chairman, Lincoln, Nebr.

Discussion opened by Dr. William Jepson, Prof. Emeritus, Surgery, Iowa University, Sioux City, Iowa.

The Individual Examination, Dr. Vincent A. Lapenta, Chairman of Council of Examiners, United States Chapter, International College of Surgeons.

5:00 P.M.—Inspection of Exhibits.

6:00 P.M.—Fish Fry on Venice Beach on the Gulf of Mexico.

All members, their families and guests are invited.

8:00 P.M.—Sun Lounge, Florida Medical Center.

Refrigeration in Human Beings and Its Effect on Undifferentiated Cells, Particularly related to Cancer, a New and Important Subject.

Dr. Temple Fay, Professor of Neurology and Neurosurgery at Temple University, Philadelphia, Pennsylvania.

TUESDAY, FEBRUARY 13, 1940

8:30 A.M.—Scientific Session, Sun Lounge.

Heteroinjertos Oseos (Heterogenous Bone Grafts).

Dr. M. Lopez Esnaurrizzar, Professor of Clinical Propedeutic Surgery, National School of Medicine, Mexico.

Discussion opened by Dr. R. B. Dillehunt, Dean and Professor of Orthopedics, University of Oregon, Portland, Oregon.

9:00 A.M.—A New Method of Tube- Pedicle Skin Grafting.

Dr. Maxwell Maltz, Plastic Reconstructive Surgery, Beth David Hospital, New York City.

Discussion opened by Dr. John Snyder, Southeastern Surgical Congress, Miami, Florida.

9:30 A.M.—Methods Preferred in Cleft Lip and Cleft Palate Repair. Lantern Slides. Dr. Warren Davis, Clinical Professor of Oral Surgery, Jefferson University, Philadelphia, Pa.

Discussion opened by Dr. George Van Ingen Brown, Prof. Emeritus, Plastic Surgery, Milwaukee, Wisconsin, and Dr. Earl L. Creveling, President Nevada State Board of Examiners, Reno, Nevada.

10:00 A.M.—Treatment of Complications of Penetrating Wounds of the Thorax and Associated Injuries.

Dr. Carl R. Steinke, Visiting Surgeon, City, St. Thomas and Children's Hospitals, Akron, Ohio.

Discussion opened by Dr. Dudley S. Conley, Dean and Professor of Surgery, Columbia, Mo.

10:30 A.M.—The Role of Extrapleural Pneumothorax in the Treatment of Pulmonary Tuberculosis—Lantern Slides.

Dr. Moses Behrend, Philadelphia, Pennsylvania, Thoracic Surgeon, Tuberculosis Sanatorium, Philadelphia General Hospital.

Discussion opened by Dr. M. O. Shivers, Colorado Springs, Colorado, Senior State Regent.

11:00 A.M.—Management of Acute Hemorrhagic Pancreatitis.

Dr. Louis Smead, Director of Surgical Staff, Toledo Hospital, Toledo, Ohio.

Discussion opened by Dr. Wm. Randolph Lovelace, Director and Chief of Surgeons, Lovelace Clinic, Albuquerque, New Mexico.

11:30 A.M.—The Indications for and the Results of Transplantation into the Recto-Sigmoid.

Dr. William Lower, Director of Cleveland Clinic Foundation, Cleveland, Ohio.

Discussion opened by Dr. Lionel P. Player, Professor of Urology, University of California, San Francisco, California.

12:00 M.—Several Cases of Osteo-chondritis in Adolescents.

Dr. Alfonso Ortiz-Tirado, Mexico City, Mexico, Chief Surgeon, Tirado Orthopedic Clinic.

Discussion opened by Dr. Joseph M. Greer, Phoenix, Arizona.

12:30 P.M.—Brief Retrospective and General Considerations and Criteria in the Surgery of Thyroid Glands.

Dr. Desiderio Roman, Clinical Professor of Surgery, Hahnemann Medical College and Hospital of Philadelphia.

Discussion opened by Dr. Andre Crotti, Director Crotti Clinic, President International College of Surgeons, Columbus, Ohio.

1:00 P.M.—Luncheon.

1:30 to 2:30 P.M.—Round Table—Guild Activities in West Virginia.

Dr. G. C. Irwin, Charlestown, West Virginia, Past Chairman.

Dr. Thos. L. Harris, Parkersburg, West Virginia, Chairman.

Guild Activities in Toledo, Ohio.

Dr. Wm. Neil, Dr. W. D. McCormack, Toledo, Ohio.

Guild Activities in New England.

Dr. George S. Foster, Manchester, New Hampshire.

2:30 P.M.—Social Program.

5:00 P.M.—Inspection of Exhibits.

7:30-9:00 P.M.—Banquet and scientific program. Main Dining Room, Florida Medical Center.

Microcinematographic and Electrocardiographic Studies of the First Heart Beats and the Beginnings of the Circulation in Living Embryos.

Dr. Bradley Patten, Director of Department of Anatomy, University of Michigan, Ann Arbor, Michigan.

WEDNESDAY, FEBRUARY 14, 1940

9:00 A.M.—Bronchoscopy and Bronchography as Aids in Surgery.

Dr. Chevalier Jackson, Temple University, Philadelphia, Pennsylvania.

9:30 A.M.—A Study, Clinical and Literary of Endometriosis.

Dr. P. Brooke Bland, Philadelphia, Pa., Prof. of Obstetrics, Jefferson Medical College of Philadelphia, Pennsylvania.

Discussion opened by Dr. Raymond E. Watkins, Portland, Oregon, Clinical Professor Obstetrics and Gynecology, University of Oregon, and Dr. Dewell Gann, Jr., Little Rock, Arkansas, Prof. Emeritus, Gynecology, University of Arkansas.

10:00 A.M.—The Treatment of Compound Fractures.

Dr. Grover C. Weil, Associate Professor of Surgery, University of Pittsburgh Medical School, Pittsburgh, Pennsylvania.

Discussion opened by Dr. John R. Moore, Professor of Orthopedics, Temple University, Philadelphia, Pennsylvania.

10:30 A.M.—Pre- and Post-Operative Care of the Patient from a Physiological Standpoint.

Dr. Benjamin I. Golden, Director and Chief Surgeon in Charge, Davis Memorial Hospital, Elkins, West Virginia.

Discussion opened by Dr. Earl B. Craig, Professor of Gynecology, Hahnemann Medical School, Philadelphia, Pennsylvania.

11:00 A.M.—Reconstruction of the Ureter.

Professor Rudolph Nissen, Department of Surgery, University of Istanbul, Istanbul, Turkey.

Discussion opened by Dr. Samuel Lubash, New York City.

11:30 A.M.—Present Status of Vitamin and Mineral Therapy.

Dr. Daniel T. Quigley, Instructor, Surgery, University of Nebraska Medical School, Surgical Staff University Hospital and Lutheran Hospital, Omaha, Nebraska.

Discussion—general.

12:00 M.—Acute Cholecystitis.

Dr. Clark D. Brooks, Professor of Clinical Surgery, Wayne University College of Medicine, Detroit, Michigan.

Discussion opened by Dr. Wm. N. Dunn, Atlanta, Georgia.

12:30 P.M.—Luncheon.

Present Social and Economic Trends and the Future of Surgery.

Dr. E. J. McCormick, Chief of Staff, St. Vincent's Hospital, Toledo, Ohio.

Discussion opened by Dr. William Jepson, Sioux City, Iowa, Prof. Emeritus, Surgery, University of Iowa.

1:30 to 2:30 P.M.—Executive Session of the United States Chapter, limited to Associate Members, Members and Fellows.

3:00 P.M.—K. M. I. Gymnastic Drill and Dress Parade.

4:30 P.M.—Garden Party at the home of Dr. and Mrs. Fred Albee, "Point O' Palms," Nakomis, Florida.

8:00 P.M.—Convocation at the Theater, Venice, Florida.

Dr. F. M. Douglass, presiding.

Dr. Benj. I. Golden, Elkins, West Virginia.

Dr. Earl Craig, Philadelphia, Chairman Cap and Gown Committee.

LADIES' PROGRAM

SUNDAY, FEBRUARY 11

4:00 to 8:00 P.M.—Registration in Main Lounge of the Florida Medical Center; Inspection of exhibits.

8:30 P.M.—Social hour—Negro Spirituals sung by C.C.C. boys in the Sun Lounge, Florida Medical Center.

MONDAY, FEBRUARY 12

9:30 A.M.—Sightseeing trip.

2:30 P.M.—Beach trip; shell gathering.

TUESDAY, FEBRUARY 13

9:30 A.M.—Visit to the Ringling Art Museum and Ringling Circus winter quarters at Sarasota, Florida.

12:00 M.—Luncheon at Ringling Hotel, Sarasota, followed by visits to the Snake and Celery Farms.

WEDNESDAY, FEBRUARY 14

9:30 A.M.—Visit to the Orchid Jungle Garden.

10:00 A.M.—Swimming party and Luncheon at the Treasure Island Beach Club.

3:00 P.M.—Air Carnival at the Fred Albee Airport.

SCIENTIFIC EXHIBITS and MOTION PICTURES

Among which are—

A New Surgical Sponge—Dr. Oscar B. Nugent, Chicago.

A New Needle and Technique for Varicose Vein Injection—Dr. F. M. Al Akl, New York City.

Rhinoplastic Surgery—Dr. M. M. Kopp, New York City.

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IMPORTANT NOTICE

For reservations, write to Dr. W. H. Hoskins, Florida Medical Center, Venice, Florida. Dr. Albee also will be pleased to book accommodations for any one by request. All members coming to Venice by automobile are requested to come directly to the Florida Medical Center for reservations, etc. All members coming by train will be met at the railroad station at Venice.

Correspondence

FOREIGN LETTERS

PRAGUE

(From Our Regular Correspondent)

November 14, 1939

Czech Society of Surgeons

The Czech Society of Surgeons, after several postponements, held its fourth Congress in Prague June 10 to 11, 1939, under the presidency of Prof. Dr. J. Divis. The principal subject of the Congress was surgery of the spleen.

Chronic Subdural Hematoma

Jirásek (Cas. lek. ces. 78: 1125, 1939) emphasizes three unexplained matters in chronic subdural hematoma: etiology, type of development and treatment. Most of the patients are men of middle age, such as were his four. The source of bleeding usually is the parasagittal veins or those of the lateral sinus. Some authors suppose there is also bleeding into the dura. In his cases operated upon during the last two years, Jirásek did not find the origin of the bleeding, although very careful revision was made. Late appearance of symptoms after the injury may be accounted for by the increase in the volume of the hematoma by repeated bleeding or osmosis. Subdural hematoma in one patient indicated triple bleeding which was confirmed histologically. The deformation of the brain caused by the hematoma, which was quite visible even by means of ventriculography, disappeared much more slowly than is usual in surgery of tumors.

In all operated cases extensive craniotomy was performed. The mere boring of holes and the use of suction is advisable only if the patient's condition is grave. The membrane of the hematoma and the clots of blood fixed to it should not be removed because of the danger of secondary postoperative bleeding. It is sufficient to remove such a quantity of the hematoma as to allow the brain to become level. Nevertheless, it was necessary in two cases to make revision of the wound on account of the secondary bleeding that ocurred 12 hours following operation. There was diffuse bleeding and again the source of bleeding could not be ascertained.

Drainage is of no special prophylactic value, since the drain very soon becomes choked. In bilitoxic conditions calcium and atropine may be recommended. Patients with subdural hematoma are sure to die, if not properly treated, and operative treatment must be therefore regarded as being successful, notwithstanding the high mortality at the present time. One of the patients operated on by Jirásek died; the others are well and their neurological condition became normal in some cases.

Splenectomy in Wilson's Disease

In three cases splenectomy had a good effect on the hepatolienal system. After operation leucopenia and thrombopenia ceased and ascites did not appear any more. There was no effect on the nervous condition, which had to be expected with regard to the irreversibility of the brain changes. The cases have not been followed up longer than two years after operation, so that it is not yet possible to judge the influence on the duration of the disease. Vahala (Rozhl. chir. 18: 464, 1939) therefore considers splenectomy to be indicated in cases with remarkable cirrhotic symptoms.

Loss of Working Capacity After Splenectomy

The loss of the spleen is up to the present time differently appreciated by doctors. Above all, the question of persistent invalidism is still pending. Knobloch (Rozhl. chir. 18: 470, 1939), experimenting on rats, produced the evidence of persistent diminished resistance against infection in splenectomized animals.

By graphs Niederle (Rozhl. chir. 18: 413, 1939) objectively represented the latent insufficiency of splenectomized people which, for example, appears in diminished readiness and ability to accommodate themselves to increased physical effort. He compared blood changes (hemoglobin, erythrocytes, proteins) occurring, after a certain unit of work had been done, in healthy persons

with changes found in splenectomized subjects. The differences in graphs were the more significant, the shorter the period of time which had elapsed from the operation; they existed, however, even after four years.

Influence of Circumscribed Diseases of Brain on Movements of Alimentary Canal

It is possible to prove the influence of some circumscribed diseases of the brain on movements of the digestive canal by means of x-ray examination. In tumors of the brain located in the neighborhood of vegetative centers (as was ascertained at operation or section), Bláha (Rozhl. chir. 18: 520, 1939) found signs of obstipation of the spastic type. In one group of patients examined there was spasm with slow emptying of the stomach; in the other there was stronger peristaltis. This difference could not be accounted for by the localisation of the tumors, this being in some cases identical in both groups. In one case of tumor of the pontocerebellar angle, x-ray examination before operation revealed spastic changes of the stomach and colon with slow emptying of the stomach. By means of x-ray examination, however, only 14 days after removal of the tumor the spasm of the stomach was found to be much more diminished, and the time of emptying normal. The prompt effect of operation on the nerves of the stomach may be therefore supposed. This case brings out clearly the fact that the peristaltic changes are really under the influence of the tumor; secondly, it shows that the type of peristaltic changes is determined not only by localisation, but also by the degree of irritation up to damage of the corresponding centers.

Echinococcosis of Lungs

The symptoms of echinococcosis of the lungs are very often uncertain. Besides increased dyspnœa with a dry cough that causes the doctor embarrassment, if he does not use x-ray examination, blood fibres may be found in the sputum. More marked hemoptysis and fever set in with suppuration. Little reliance can be placed in Casoni's and Weinberg's reactions and eosinophils. The best method of diagnosis is x-ray examination, but even so echinococcosis may be mistaken for tumor. Just the small sickle-shaped clearing up over the superior pole of the cyst may be considered as an absolutely reliable symptom. Kostlivy, (Rozhl. chir. 18: 611, 1939) operated on 7 cases and results in all were successful. In cases with adhesions it was sufficient to make incision and to drain. If there are no adhesions to the pleura, he operates in one session having performed minor pneumothorax before. After performing probatory puncture in order to localize the cyst, he injects two to three cc. of one per cent solution of formol to kill the worm. He removes the cyst with the capsule, without draining or suturing the cavity, fixing, however, the edges of the lung wound to the pleura. He does not suture even the wound after costotomy, covering it only with gauze and vaseline. There were no complications. Antonazzi's method was used in one case, with iodizing of the common marsupialization.

Fatty Embolisms in Thoracoplasties

Three young patients died of fatty embolisms after thoracoplasties for cavernomatous tuberculosis. Two were apoplectic and one was chronic in form. Histologically fatty embolism was found, in two cases in the pulmonary circulation as well as in the systemic, in one case only in the pulmonary. In no case was one of the foramen ovale found. Fatty embolism is very rare in thoracoplasties, but Brunclík (Rozhl. chir. 18: 633, 1939) states that a certain number of patients die of this complication without correct diagnosis being made, for it may be mistaken for postoperative shock, bronchogenic or miliary dissemination of a process, edema of the lungs, or the final stage of secondary anemia. The cause may be explained by damage to the bone marrow during the costotomy. It is advisable to think of the possibility, especially nowadays, that in some cases one can use decholine with good results.

X-rays in Essential Disseminated Polyposis of Colon

Even symptomatic treatment of disseminated polyposis is a very difficult problem. Sváb (Rozhl. chir. 18: 764, 1939) treated two young men with typical romanoscopic and roentgenologic findings of polyposis in the period during which they presented severe symptoms of secondary colitis: diarrhea with mucus and blood during the last two to four years and heavy loss in weight. For 12 days x-ray treatment was given in five abdominal places (10x15 cm.), at a distance of 50 cm., with 1 mm. copper filtration plus 1 mm. aluminum filtration. He utilized 175 kilovolts, making use of 4 milliamperes and delivering 265 r/v at intervals of 5 days. During this treatment the patients had abdominal pain and nausea and felt weak. After several days, however, the condition became better. In one patient, who has been followed for 5 years after x-ray therapy, diarrhea has appeared only in the spring and autumn, and during the last two years it has entirely ceased and the patient has put on weight. He no longer has any trouble and receives no treatment. The roentgenologic finding of polyposis is still present to the same extent; the haustra that were not visible before are now quite visible. In the other patient the time which has elapsed after treatment is still very short

(half a year) so that it is not possible to make definite conclusions.

Effect of Vitamin A on Secretion of Pancreatic Juice

It is well known that people suffering from acidity feel better after they have been given vitamin A. They develop an appetite, their diarrhea ceases, the rest of the undigested food disappears from their stools and they put on weight. The amount of free hydrochloric acid, however, remains uninfluenced. Herfort (Cas. lék. ces. 78: 943, 1939) investigated therefore into the effect of this vitamin on the external pancreatic secretion. He found that vitamin A, whether given per os or injected intramuscularly, regularly and considerably stimulates the external pancreatic secretion, by which the above mentioned therapeutic effect may be explained. On account of this stimulating effect, Herfort recommended the use of vitamin A also for the treatment of diseases of the pancreas. In 60 persons to whom vitamin A was given there were higher rates of ferments of the duodenal juice in comparison with those of the same persons after ether, cream, hydrochloric acid, and even secretion. The results made on the basis of these investigations were confirmed during operation, by histologic examination or by section.

Sir John Lynn-Thomas, F.R.C.S., F.A.C.S., died Sept. 21 at his home in Llechryd, Cardiganshire, Wales, at the age of 78 years. During the war of 1914 he was consulting surgeon to the Western Command and then deputy inspector of military orthopedics. He was primarily responsible for the establishment of the Prince of Wales hospital in Cardiff which began as a hospital for limbless soldiers and later became a complete orthopedic unit.

He retired from practice in 1921 but was still active in medical affairs and served on the council of the Royal College of Surgeons from 1918 to 1933. In 1931 the honorary license of the Society of Apothecaries of London was conferred on him.

Dr. Manuel F. Madrazo, F.I.C.S., of Mexico City, has been elected Regent of Radiologic Surgery by the Mexican Chapter of the International College of Surgeons.

Dr. James B. Murphy, member of Rockefeller Institute, New York, received the decoration of "Officer of the Order of Leopold" from the King of the Belgians in recognition of his work in the field of cancer research.

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APPLICATIONS FOR ASSOCIATE MEMBERSHIP, MEMBERSHIP AND FELLOWSHIP IN THE INTERNATIONAL COLLEGE OF SURGEONS MAY BE ADDRESSED TO DR. CHARLES H. ARNOLD, 908 TERMINAL BUILDING, LINCOLN, NEBRASKA. THESE WILL BE ACTED UPON IN THE REGULAR ROUTINE AS OUTLINED IN THE BY-LAWS. APPLICATIONS FOR CONSIDERATION MUST BE RECEIVED NOT LATER THAN A MONTH PRECEDING THE REGULARLY STATED ASSEMBLY MEETING.

Book Reviews

Tratado de clinica propedeutica quirurgica. By Dr. Miguel Lopez Esnaurrizar, Professor of Materia, Faculdad de Medicina, Universidad Autonoma de Mexico. Pp. 256, with 61 illustrations. Mexico: Union Tipografica Editorial Hispano-Americana, 1939.

THIS book presents an interesting and complete survey of all the means which may be used by the examining physician in his effort to diagnose a surgical pathologic condition before starting the treatment. Every single procedure, symptom, physical sign or test which may be helpful in the approach of the anomalous condition is quoted and interpreted. Hereby, the author emphasizes especially the value of the primitive and simple forms of the medical exploration, such as inspection, palpation, percussion and the testing of functional movements. With instructive clarity and great precision, the far reaching importance of the physical examination is pointed out; every single sign which may be observed in any of the important pathological surgical conditions is discussed and interpreted as to its significance and meaning. The limits, however, of this type of physical exploration are fully recognized and laboratory procedures are referred to wherever more objective information may be indicated by the former.

The book is intended primarily for the student, but its study will also reward the experienced surgeon. The student will be grateful for the excellent outline of approach to certain surgical conditions as well as to the patient himself. The practitioner may obtain quick and valuable information as to the establishment and confirmation of a diagnosis, since this book contains a collection of helpful symptoms and signs which rarely can be found elsewhere but in large textbooks. The reader will appreciate the carefulness with which the author has eliminated all questionable procedures which do not have the backing of the generally accepted practice; on the other hand, not even the smallest, but reliable, detail is unmentioned which could lead to a better understanding of the condition to be analyzed.

The book is divided into three parts, of which the first one contains general considerations about the information one may obtain by means of physical examination, general observations and several technical procedures, such as exploratory puncture, biopsy, roentgenograms and laboratory tests. The second part presents a discussion of important points in the examination of tumors, fractures, wounds, lymph glands and peripheral circulatory apparatus as far as surgical interest exists. The third and main part of the book consists of eleven chapters dealing with the special pathology and diagnosis of the surgical conditions of the different regions of the human body. The last portion of the book contains general ideas about several problems, such as prognosis and history taking.

The book contains abundant and interesting material in applied anatomy and functional pathology, illustrated by more than 60 pictures. It is informative and instructive for the experienced and an excellent means of introduction to as well as instruction in surgical understanding and knowledge for the beginner.

K. SANDBERG

Surgery of the Eye. By Meyer Wiener, M.D., Professor of Clinical Ophthalmology, and Bennett Y. Alvis, M.D., Assistant Professor of Clinical Ophthalmology, Washington University School of Medicine. Price, $8.50. Pp. 455, with 452 illustrations on 396 figures. Philadelphia: W. B. Saunders Company, 1939.

AS stated in the introduction to this book, the authors had in mind the writing of a textbook of surgery of the eye that would in its entirety live up to the standards of the presentation of the tear-sac-extirpation in Meller's textbook of eye surgery. Although the reviewer feels that Meller's book contains many more good features than this one, it can be said that Wiener and Alvis' textbook is of high value for various reasons.

The authors did not intend to write a textbook comprising all procedures used in the past and present but undertook rather to report in detail those operations which have proved most successful in their own experience, always bearing in mind the fact that they were presenting the subject to the average eye surgeon. Thus, the book

is of special value to the young surgeon who may compare his own technic with that of an authority like Meyer Wiener.

In contrast to Meller's book with its European background, Wiener and Alvis' surgery represents American methods and development. Among the greatest attractions of the book, however, are the numerous illustrations. They were designed by a talented physician who, of course, could add his medical knowledge to his technical skill in designing. Whenever necessary, special inserts showing a magnification of the essential feature of the picture have been added. Thus, in many cases (e.g., in McReynold's operation for pterygium, the glass-ball-implantation after enucleation, various plastic procedures and eye-muscle-operations) a classical result has been obtained.

The book can be highly recommended to every eye surgeon.

MAX HERZOG

Clinical Electrosurgery. By Gustavus M. Blech, G.C.S., G.C.G., M.D., LL.D., formerly Professor of Clinical Surgery, Loyola University; Consulting Surgeon, Westlake Hospital; Attending Surgeon, Edgewater Hospital. With chapters by Hector Alfred Colwell, M.B., Ph.D., D.P.H., L.R.C.P., M.R.C.S., and Brian Wellington Windeyer, F.R.C.S., D.M.R.E., Middlesex Hospital. Price, $4. Pp. 389. New York: Oxford University Press, 1939.

THE author has written a monograph consisting of 16 chapters "based on forty years' clinical experience.". The chapter on "The Historical Development of Electrosurgery" by H. A. Colwell and the chapter on "Radiotherapy of Neoplasms" by Windeyer and Colwell are excellent. It contains a glossary of 8 pages.

The text of the book does not contain a single photograph or microphotograph of tissues removed by electrosurgery nor do proper illustrations augment the text.

Since the Science of Surgery has been based on pathology for centuries, it is imperative that modern surgical practice be based on the biological sciences.

I reprint a few from many statements made throughout the book which stamp the value of the text. We read on page 67: "This book being intended for *self-instruction* (sic) a few suggestions for the acquisition of a correct electrosurgical technique may not be amiss." On page 125 the author states, "For the past five years we have incised each furuncle with the electrotome (cutting current) most often under local analgesia, but occasionally without any form of analgesia. We employ this procedure even at a stage before pus can be demonstrated, because quite often one finds that the pain has been relieved, drainage eventually becomes established and further surgical intervention is obviated." Another example is found on page 200: "Malignant Goiter. The operation is technically very difficult, but surgeons who have had even a limited experience with the electrosurgical removal of benign goiters should have no unusual difficulty in carefully excavating the concerned structures with the loop electrode provided of course the parathyroids have been exposed to view."

His classification of tumours is rather unorthodox.

On page 208 we read, "We group Ca + cases of Paget's disease and chronic cystic mastitis in which the diagnosis of cancer may be entirely wrong or correct." And on page 209, "The symbol of Ca + + is given to all mammary tumours which are either definitely known to have appeared but recently (not merely accidentally detected by the patient), that are soft to the feel, of a size not exceeding a walnut, without evidence of an inflammatory mass in the vicinity of the neoplasms and in which the most careful palpation fails to detect enlarged axillary and subclavicular glands. An additional condition is that the woman is of climacteric age or in the case of a man that he has passed the sixtieth year of life."

While the Oxford University Press has maintained its high degree of efficiency of production, the reviewer regrets that this book cannot be recommended.

W. J. CARSON

Chronic Diseases of the Abdomen. By C. Jennings Marshall, M.S., M.D. (Lond.), F.R.C.S. (Eng.). Price, $6. Pp. 247, with 131 illustrations. Boston: Little, Brown & Company, 1939.

CHRONIC abdominal symptoms constitute frequently perplexing problems. A volume on the subject is timely. Dr. Marshall's work fills a much needed want in this respect.

The first part of the work deals with the technic of physical examination of various parts of the body and methods of procedure, both clinical and laboratory.

The second part discusses symptomatology from many points of view. The evaluation and interpretation of both subjective and objective manifestations is stressed. One is impressed even after a casual thumbing of its pages with the excellence of the work.

On page 38 one finds splendid guide posts in the diagnosis of anastomotic ulcer. Equally impressive and instructive is the discussion on diagnostic criteria of pancreatic pseudo cysts. The material

referring to jaundice is noteworthy. The chapter on radiologic examination is equally thorough and contains many illustrative points.

However, on page 30 one may take exception to the statement: " 'What may be learned by a straight radiograph of the abdomen without any contrast media?' The answer is, by accident a good deal; otherwise, probably nothing." This is not quite correct, for flat plate radiograms taken as diagnostic measures in intestinal obstructions are quite informative. In perforations of the stomach this equally holds true.

All in all, the book is a distinct contribution to contemporary medical literature and should be in the hands of every surgeon, student and medical man and on the shelf of every library. The index is comprehensive and thorough.

M. T.

Les causes de la mort au cours de l'occlusion intestinale haute expérimentale. By J. Bottin. Paper. Pp. 373. Louvain, Belgium: Etablissements Fr. Ceuterick, 1938.

THIS is a voluminous report and a scholarly discussion of the author's numerous experiments on the various types of intestinal obstruction which he induced in lower animals. It is a thorough survey of the whole subject. The author impartially reviews the work done by previous experimenters. The subject is exhaustively treated from the physiologic, biochemical, clinical and surgical standpoints. It is a classical work and clinicians and surgeons will be well benefited by the studious reading of this valuable and enlightening contribution. The author discusses the various theories — toxic, infectious, shock, etc.— that have been advanced, and also the influence of the condition on the various abdominal viscera —the suprarenal glands, the liver, etc.

The author demonstrates that intestinal obstruction leads to massive dehydration and important demineralization of the blood. There is a blood loss of sodium, potassium, calcium and chloride. The blood shows an increase of nonprotein nitrogen. There is a fall of arterial pressure and a marked diminution in the ability of the subcutaneous cellular tissue to absorb normal solution. This lessened capacity of the subcutaneous cellular tissue for absorption is due to several factors: anhydremia, blood demineralization, fall of the peripheral arterial pressure, toxic phenomena.

He describes various methods employed for the prolongation of life in this condition and shows why they fail to give satisfactory results. He shows by experimental results the outcome of ligation of the hepatic excretory ducts, and of ligation of one or both pancreatic ducts. A most interesting chapter is devoted to the influence and to the lesions found and brought about in the pancreas by intestinal obstruction. He attributes the deaths determined by intestinal obstruction to dehydration and demineralization and to intoxication from these factors, intoxication being the most important. This intoxication has its origin in pancreatic pathology. Many different therapeutic procedures are discussed in detail.

We would advise that the work be read and studied by all progressive physicians. The book contains over 1,100 bibliographic references. It

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